RAILROAD GAZETTE

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Contributions

Setting Locomotive Valves.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In an article on valve setting in *Railway Machinery*, a writer does not consider the testing of the cut-off of a locomotive of any importance, a feature which I consider of value particularly for a high-speed locomotive. It is rarely the case, after overhauling, that the cut-off will be equal for the low points, and it is quite often the case that no attention is paid to this essential feature. I prefer setting the valves with the steam chest covers off. Possibly the shop might feel it could afford to have a set of trams, master gages, etc., as described by the writer of the article in question, but I do not consider them absolutely essential for accurate work.

Suppose it was required to run over the valves of an engine because it was lame when cutting off short? The wheel tram marks would have to be found, as would also the valve-stem mark, as the old ones could not be relied on for accuracy. The guide yoke should be used for the stationary end of the tram, instead of using the main rod, as a fixed point is safer. Then square the valves in full stroke position, or, if the engine is reported lame, no attention need be paid to the full stroke, providing we know the lead is constant. Assume that an engine is running ahead, with the cut-off at 6 in. Having placed the reverse lever in the proper notch, and having the steam chest covers off, and the crosshead travel marked on the guides, move the engine ahead, and, using a strip of thin tin, stop the engine when the tin can just be forced into the port, at the end of the valve. This is the actual point of cut off. Now measure the distance the cross-head travels from the end of the stroke, which is, say, 5½ in., from the right, forward, end. Going to the opposite side of the engine, get the distance traveled in the same manner—the next in order being the left forward end. This is found to be say 8 in. Then examine the right back end, and the distance is, say, 7½ in. Similarly the left back cross-head has traveled, say, 6 in. The left forward end is therefore taking a larger volume of steam than the right forward end and would consequently do more work, and give a heavier exhaust. To correct this the valve travel must be changed and the eccentric rod lengthened so as to throw the valve ahead, making the cut off take place earlier. The right back end is taking too much steam, so its eccentric rod is shortened, bringing the valve back and making the cut-off earlier. Having made these changes, run the valves over again and we find we have 6¾ in., 7 in., 7¼ in. and 7 in., which is as near as can be obtained in practice. If, on the other hand, we find on first trial a series of exhausts like this—6½ in., 8 in., 7 in. and 8 in., the exhausts of the left side being heavier, there may be two causes for this. One arm of the lifting shaft may be bent, or the link hanger may have been bent and made a little longer in straightening it. To remedy this defect the opposite link hanger may be drawn out a little to drop the link, or if new link saddles are being fitted, we use a saddle with slotted holes and any slight errors may be corrected by moving the saddle. After having the cut-offs in "square," the saddle is marked, and the marks transferred to permanent saddles. With this method no attention need be paid to the angularity of the rod.

If now it is required to fit a new quadrant to an engine and have the notches cut in it, first put the quadrant in place and fasten the lever in forward position. As the engine is moved ahead note the travel of the link blocks, taking care that they do not strike in the top of the link. The back link-block is set in the same manner, care being taken that the link-block does not strike in the bottom of the link. The position of the center notch is found by placing the crank at either side of the quarter. Then move the lever until the valve lap is equal on both sides. This will be the position of the center notch, and the valve will uncover the steam ports an amount equal to the lead when the crank is on the center. If we want to cut notches in the quadrant at any stated cut-off put the lever in forward position and moving the engine ahead, measure off on the guides the required amount of travel; then move the lever back until the strip of tin can just be forced into the port as before. This gives the position of the notch, and can be verified by moving the engine, with the lever in this position, and measuring as before explained.

I have run engines that, when hooked up short, would go on three legs, but by watching the cross-head the blind end could be located and remedied. One engine in particular could not be squared in the usual manner, as the cylinders were inclined, while the steam chests and valve faces were level. Here is a case where sound setting was the only way to get it square. I have worked on roads where it was thought necessary only to square the valves in full stroke, paying no attention to the cut-off. Again, some roads make a practice of not slotting the bolt holes in the eccentric rods or straps, and if valve rods are not provided with right and left nuts, for adjustment, the eccentric rods must be drawn or upset as occasion requires.

J. V. N. CHENEY.

The Car Coupler Law.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest your editorial of May 6th in which you tell of a decision by Judge Van Devanter, of the United States Circuit Court of Appeals, holding that when a brakeman or a switchman opens the knuckle of a Master Car Builders' coupler he is performing a part of the act of coupling. The learned judge reaches this surprising conclusion by a course of reasoning which is very ingenious, but which, it seems to me, most railroad men will find it hard to swallow. To the non-railroader probably the judge's reasoning is satisfactory, though it seems to me that even the layman will be a bit flabbergasted at the coolness with which the judge inserts a comma where Congress carefully omitted one. The judge ends this part of his discussion with the clincher that those who disagree with him are engaged in a "mistaken attempt" to separate a part of an act from the whole.

But what are the facts of the situation, and what may we reasonably conclude were the facts before Congress when the coupler law was passed? The opening of the knuckle preparatory to coupling two cars may be done when the car is at rest; when it is perhaps ten rods away from the point where the coupling is to take place, and any number of minutes or hours before the coupling is to be made. This every railroad man knows. If we are to call this a part of the act of coupling we ought to be able to show very clear and simple reasoning to justify the decision. The judge refers to the dangers of the old link and pin coupler, when a man was obliged to go between the cars. It was principally to avoid this going between the cars that the law was passed. But the essential difference between what the brakeman had to do then, and the process of opening a knuckle now, is that with the link and pin the going between the cars had to be done while the cars were moving, or just at the instant of coupling or uncoupling; while the opening of a knuckle may be done, as before stated, when the car is at rest; when both cars are at rest. I am not speaking now of the most convenient way of performing either operation, or of what the practice was, or may have been; but only of the necessities of the case. It was absolutely necessary to support the link at the instant of coupling; the only relief from this was to use a stick, and that was an expedient which was found to be impracticable; the superintendent could not enforce the use of sticks. To uncouple, the brakeman could, theoretically, ride on the dead wood or buffer beam, and in many cases could uncouple without great danger, but, practically, much uncoupling was done while the cars were in motion, and the man was walking along on the ground between the ends of two cars. This was a practical if not a theoretical necessity. With the automatic coupler, as before stated, there is no necessity of going between the cars to open a knuckle when either car is in motion. Who that has ever worked in a railroad yard will join Judge Van Devanter in this court-room logic?

So much for the judge's acuteness in seeing the facts and for his reasoning. As a practical matter I should like very much to see all M. C. B. couplers fitted with spring knuckle-openers; and it would be pleasant to be able to believe that a judicial dictum could bring about this desirable, but difficult, improvement. I fear, however, that this is a "mistaken attempt" on the part of the judge to read into the words of the statute an idea that is not there. How long will this interpretation stand? As the Chicago, Milwaukee & St. Paul Railway seems likely to win its suit against Voelker, I suppose that there is no likelihood that it will appeal this suit to a higher court; and as Voelker's administratrix will have been beaten on another issue, it seems unlikely that she will again appeal. The Government is not likely to try to reopen the case, as the Government is, no doubt, well satisfied with the decision as it stands. Moreover, it is not apparent to the layman that any issue could be raised which could take this case to the Supreme Court; the Circuit Court of Appeals is the court of last report. But the question is likely to come up again in some other suit at any time, and therefore this curious, not to say strained, construction of a plain statute may be the law of the land for a very short time, or it may stand for a number of years. The coupler inventors should make hay while the sun shines. At the present time the law seems to be that when a man is opening a knuckle he is coupling cars; and when he is coupling two cars together the company is in duty bound, according to the law, to see that he does not need to go between them. But of the two legs supporting this fragment of law, one is the assumption that when a man is only part way from the outside of the car toward the middle (toward the coupler), and is there only for two or three seconds, he is not there at all. This is a pretty weak leg. The man is part way in, practically, but entirely out, legally. The inventors of automatic knuckle-openers must jump in and supplant this weak leg with a strong one.

C. F. T.

Union Rules Submitted to the Atchison.

The following extracts are taken from a proposed set of rules submitted to the Atchison on March 23 by the International Association of Machinists. The comment following each rule is by J. W. Kendrick, Third Vice-President of the railroad company. Without regard to the demands for increased pay, the fundamental objection, taking different forms in response to specific demands, is, in the words of Mr. Kendrick, that there has been organized in the shops "a body or instrumentality for the purpose of exercising a certain degree of control over the operation of said shops which cannot rightfully attach to any but the owners thereof." Further comment on the principles involved will be found in another column.

Rule II.

When it becomes necessary to reduce expenses, the hours shall be reduced and not the force, overtime to take effect immediately after the working hours in force.

The company cannot submit to dictation with respect to the course to be pursued in the matter of force to be employed, or the work to be performed by that force. As a rule, it will be the aim of its officials to consider the greatest good of the greatest number, but as the representatives of the company that owns the shops, we cannot, and will not, consent to an arrangement which will confer upon the employees any of the rights or privileges of ownership.

Rule III.

* * * The working of overtime shall not be compulsory except on running repairs.

* * * The provision that the working of overtime shall not be compulsory, except upon running repairs, would result in controversies as to what constitutes running repairs under various conditions. The company does not desire to have its men work overtime, but it cannot consent to the introduction of a rule which will enable a man to elect whether he will work or not, and at the same time remain in the service of the company.

Rule IV.

A machinist is classified as a competent general workman, competent floor hand, competent lathe hand, competent vise hand, competent planer hand, competent shaper hand, competent milling machine hand, competent slotting machine hand, competent injector and lubricator hand, competent air man, competent boring mill hand, competent tool maker. To be considered a competent hand in any class, he shall be able to take any piece of work pertaining to his class, with the drawings or blue prints, and prosecute the work to a successful completion within a reasonable time.

It is further understood that wheel lathes, turret lathes, fox lathes and bolt lathes, also steam shovels, pile drivers, rail saws, all air hoists, air cranes and steam water pumps, gas and gasoline engines, quartering machine, such bench work as fitting driving brasses in boxes, fitting eccentrics and straps together, leveling up driving spring rigging, fitting engine truck work, driving or truck brakes, stripping engines for back shop, or the assembling or disassembling of metal parts of all shop machines and locomotives shall be considered as machinist's work.

This rule provides that any specialist who is competent to perform any single branch of machinist's work shall be classed as a machinist, although he may be wholly incompetent to perform all of the duties of a machinist, in all other branches of work. In other words, it results in the classification of all handy men as competent machinists. Moreover, it provides that practically all machine tools shall be operated by machinists, who would necessarily be paid at the first-class machinist rate, regardless of their general skill. It is a well-known fact that many of our best workmen on machine tools are those who can perform only this particular class of work. As such men are not machinists, they are not entitled to machinist's pay. The rule further provides that a great deal of rough work, which does not constitute machine and tool operations, shall, nevertheless, be performed by machinists. Much of this work can be as well, or better, done by helpers and handy men. It is found that machinists consider work of this character irksome, and will not

undertake it except at certain times, when work is scarce. Their general dissatisfaction with tasks of this character is such that they do not perform a full or satisfactory day's work; and in times when there is a plentitude of machinist's work—applying the term properly—they will not occupy the positions that call for less skill, and which are consequently of less interest, and possibly more arduous as regards manual labor; and it is within the experience of the officers of this company that in cases where the character of the work to be performed by machinists is defined as specifically as in Rule 4, full-paid machinists, while not desiring to perform the work themselves, have objected to its performance by any other men. The leveling up of draft spring rigging, fitting of engine truck work, driving or truck brakes, stripping engines for back shops, or the assembling or disassembling of metal parts, and other general work, can in general be done by men who have not learned the machinist trade.

Rule V.

Handy men, helpers and laborers shall not be advanced to the detriment of machinists or apprentices. Handy men now doing machinist's work shall continue as in the past, and after working four years' continuous service as a handy man, at the class of work he is now employed on, he shall receive the minimum rate of pay paid to machinists in that locality, but when their positions become vacant they shall be filled by machinists.

This rule is objectionable. The company must and will reserve the right to employ men to perform certain work in accordance with their attainments. A man may run a machine for four years, and still be incapable of performing the general duties of a machinist. Nor can the company agree that the places now filled by men of this character, shall, upon becoming vacant, be given to full-paid machinists. The company will always reserve the right, which it undoubtedly possesses and of which it cannot be dispossessed, of employing men with reference to the work to be performed, and to pay them in accordance with the equitable rates that prevail at the time of their employment.

Rule VI.

One apprentice may be employed in each shop irrespective of the number of machinists employed, and not more than one additional apprentice shall be employed to every five machinists, to be based on the average number of machinists employed in each shop. This ratio not to affect apprentices already in the service.

This company will never be a party to a general arrangement for the curtailment of the education of the sons of its machinists or other employees, or the people in the various communities traversed by its lines. The ratio of apprentices to machinists should vary according to the character of the shops. There are some shops in which conditions are such that no apprentices can be employed either with profit to themselves from the standpoint of experience, or to the employing company. There are others where a very considerable number of machine tools are used, which afford an excellent opportunity for the education of these young men. It is recognized that the object of this clause is to limit the number of men that can come into the trade from apprenticeships. The right of your organization, or any other, to impose conditions of this kind upon an employing company, is not recognized, nor will it be conceded.

Rule IX.

No machinist or apprentice shall be discharged or suspended without just and sufficient cause. If discharged, a clearance shall be given, showing the actual cause of dismissal; and if, after proper investigation, it has been found a machinist or apprentice has been discharged or suspended unjustly, he shall be reinstated with full pay for time lost; the investigation to take place within five days after discharge or suspension. The shop committee have power to act and treat with the management in regard to such cases. The District Grievance Committee have power to act in conjunction with the shop committee.

It is the present custom and practice to give employees service letters when the length of service is sufficient to warrant it. In case of discharge, if the dismissed employee complains and it is found that his complaint is warranted and dismissal was not, the error is corrected. While it is proposed to give every employee every facility for the rectification of errors in the matter of discipline, amount of compensation based on time worked, etc., in view of the fact that it is within the experience of the officers of our Mechanical Department, that shop operation has at times practically ceased, pending a visit of the shop committee to the foreman or master mechanic, and a decision of the question in controversy, the company cannot enter into an agreement which will give recognition to a shop committee of employees, which will be permitted to present grievances, real or alleged, during working hours. It is the policy of the company that each person in its employ shall be treated with exact fairness, and that failing to receive what he believes to be such from his employing officer, he shall have the right to appeal, either in person or through the medium of a committee of his associates, but the company will not consent to the recognition of a "shop committee" (commonly so styled), which will have the right to interfere with the conduct of the business of the shop.

Rule XX.

A printed copy of these rules and regulations shall be framed and posted in a conspicuous place in each shop and roundhouse on all leased and operated lines.

The officers of this company will establish all the rules that may be necessary for the government of its shops and the employees working therein.

Locomotive Testing Plant of the Pennsylvania at St. Louis.*

The Pennsylvania has been assigned a space in the Transportation Building of the Louisiana Purchase Exposition, 300 ft. x 90 ft., a portion of which will be devoted to the locomotive testing plant. The general arrangement of the plant is shown by the accompanying illustration.

The locomotive under test is carried on supporting wheels whose axles are extended to receive absorption brakes. The turning of the driving wheels causes the supporting wheels to revolve, but these are retarded by the brakes to any extent desired. The work actually done by the locomotive consists in overcoming the frictional resistance of the supporting wheels and brakes, the resulting force exerted at the drawbar being measured by a traction dynamometer. The upper faces of the supporting wheels "J" are at the level of the tracks and of the floor of the building, with a pit of sufficient depth for these wheels and their supports. The base of the plant consists of two longitudinal bed plates, "A," of cast iron, secured to concrete foundations to resist the shocks transmitted from the locomotive driving wheels. The bed plates are provided with T slots running longitudinally, and by means of suitable bolts the pedestals "B" are secured to them, thus permitting adjustment lengthwise, in order that the supporting wheels may be spaced to correspond with the driving wheels of the locomotive.

There will be two sets of supporting wheels, one consisting of three pairs, 72 in. in diameter, for use under passenger locomotives having large driving wheels, and one set of five pairs, 50 in. in diameter, to be used under locomotives with smaller wheels and designed for freight service. The pedestals will be of two heights; the lower ones for the supporting wheels of larger diameter, the higher ones for the smaller supporting wheels. The journal boxes carried in the pedestals are self adjusting so as to secure uniform support for the journals. The lower half of the box contains a bronze bearing, while the upper half, which acts only as a cap and carries no weight, is made of cast iron. In order to provide against any possibility of heating, the journal boxes are cored out and arranged for cooling by water circulation. The lubrication is accomplished by two chains over each journal dipping into a bath of oil.

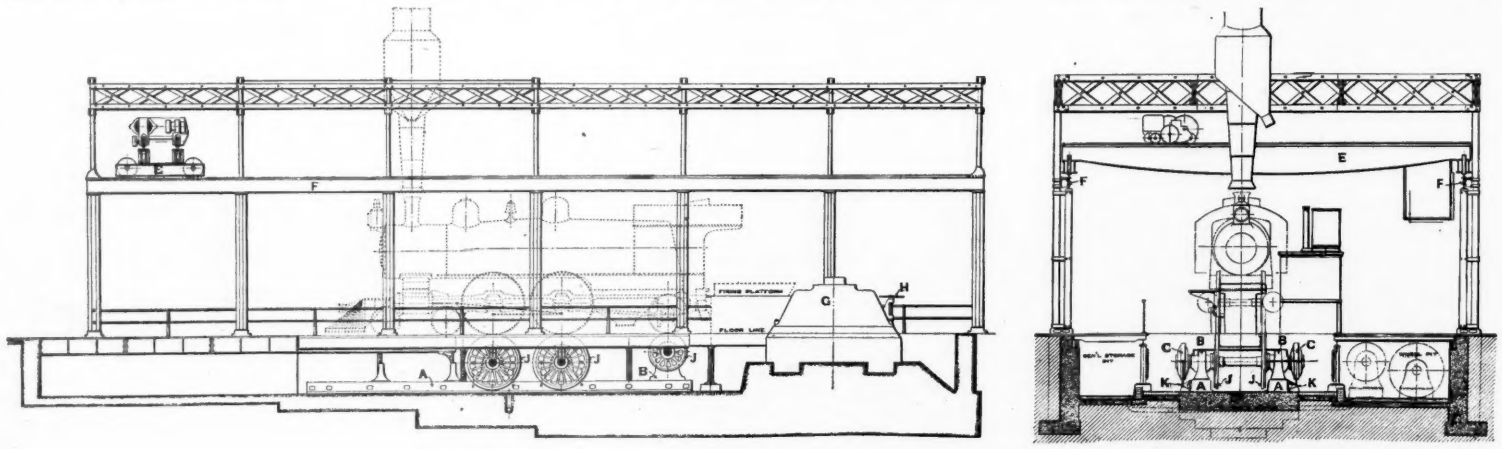
On the ends of each supporting shaft are the absorption brakes "C," which form the resistance which the locomotive must overcome, in order to exert its tractive effort at the drawbar. This type of brake was first used as a dynamometer at the Worcester Polytechnic Institute, and is the invention of Mr. G. I. Alden, M.M.E., formerly a member of the Institute faculty. This brake in its simplest form consists of: (1.) A smooth, circular, revolvable cast-iron disk, with radial grooves, keyed to the shaft which transmits the power to be absorbed. (2.) A non-revolvable housing having its bearings upon the hub of the revolvable disk. (3.) A pair of thin copper plates fastened to the housing, one face of each copper plate being close and parallel to the sides of the revolvable disk, the other face of each plate having back of it a chamber in the housing. (4.) A system of piping and connections by means of which water under pressure can be circulated through the chambers between the copper plates and the housing. (5.) A system of piping and connections by means of which oil is circulated in such manner as to insure perfect lubrication of the copper plates which are next to the revolvable cast-iron disk.

To insure sufficient capacity, each brake is provided with two disks revolving inside of each housing with a suitable arrangement of copper plates and water chambers, to allow pressure to be exerted on both sides of each disk. Oil for lubrication between the revolving surfaces, enters near the hub of the disks and is carried by centrifugal force along the radial grooves in their sides and out to their peripheries, completing the circuit through external tubes. The housings of the brakes are held against turning by rods attached to brackets "K," which in turn are held to the sides of the bed plates by bolts in T slots.

The seats on the supporting shafts for the hubs of the brake disks are tapered, as shown at "D," keys being placed in the shaft and hub to prevent turning. Nuts on the smaller end hold the hubs in position. Eight absorption brakes are provided, and may be used either on the shafts having the 72-in. supporting wheels, or on the shafts with the 50 in. supporting wheels, means for removing the brakes readily being provided by the taper fit already mentioned and a nut at the large end of the taper, so that the hub of the brake can be backed off without difficulty or delay.

When the brakes are in use, water under pressure flows through the chambers in the housings, pressing the copper plates against the sides of the revolving disks and causing resistance to their rotation. The pressure of the water is regulated by valves controlling both the inlet and outlet independently. The water thus performs the double function of supplying by its pressure, the required friction, and by its rate of flow means of carrying off the heat generated. The pipes leading to and discharging from the brakes are brought together at one point where all the valves will be located, so that the pressure and rate of flow, can be readily adjusted to the work being done. To keep the speed of the locomotive constant, would ordinarily require hand manipulation of the valves controlling the ingoing and outflowing water, but in order to secure as nearly as possible constant speed, there is a by-pass around the main valve controlling the supply of water for all the brakes, and in this by-pass is an automatic valve controlled by the speed of the locomotive. If the speed increases beyond the desired number of revolutions per minute, the by-pass valve opens, so as to increase the pressure on the brakes, and if on the other hand, the speed of the locomotive falls below that desired, the automatic valve closes, and decreases the pressure on the brakes.

The supporting wheels resemble in form, the usual locomotive driving wheels, having cast steel centers with tires shrunk on, and held in addition by retaining rings. The contour of the tire is approximately that of the head of a rail, but provided with means of keeping away from its bearing surface the oil which will necessarily drip from the locomotive while running. The pit containing the parts already mentioned, is extended sufficiently to provide room for the storage of the supporting wheels, axles, brakes and pedestals which are not in use, and provides storage for such other supplies and appliances as will be necessary for the operation of the plant. The floor covering this portion of the pit, is made in sections, so that it can be removed as occasion may require. The central portion of the pit, however, will be entirely open with the exception of sufficient platform to enable those taking part in the tests to secure indicator cards, make observations of temperatures and obtain other information of this character. A traveling electric crane "E," of 10 tons capacity, and having a span of 43 ft. between centers of runways "F," serves the entire space occupied by the testing plant, also sufficient space beyond the pilot of the longest locomotive to be tested, to reach the cars loaded with supplies for the plant. The crane will be used for handling the suppor-



The Pennsylvania Railroad Locomotive Testing Plant at St. Louis.

*From Bulletin No. 2 published by the Pennsylvania Railroad Company.

ing wheels, axles, brakes, pedestals and other parts, when necessary to change their setting and further, for handling all of the coal used during the tests.

The water required for locomotives under test, will be weighed in two tanks, filled alternately, and run from these into a third tank, from which it will be taken by piping to the connections for the injectors. As a check on the weights thus obtained, the whole supply used will be metered and readings taken at such intervals as will enable the amount shown by weighing to be compared.

The traction dynamometer "G" which measures the drawbar pull of the locomotive, is of the lever type and is constructed on the "Emery" principle, in which flexible steel plates take the place of knife edges used in ordinary scales. The weight of each lever is taken by a vertical plate in a plane intersecting that of the receiving fulcrum plates at their center of rotation, thus relieving these plates of all transverse load. The yoke embracing the dynamometer and to which the drawbar is attached, is also mounted on flexible plates and braced by long and flexible rods, to insure frictionless motion in the horizontal plane only. The total motion of this yoke and drawbar, due to the leverage of the machine and to stress of parts when under full load, does not exceed .04 in., so that a locomotive exerting a drawbar pull equal to the full capacity of the dynamometer, will not move forward on the supporting wheels more than .04 in. The drawbar is provided with a ball joint, to allow for any side motion of the locomotive, or motion of the locomotive on its springs.

Near the base of the dynamometer, the oscillating motion of the ends of the last levers, is transformed into a rotary motion by means of steel belts wrapped around a drum and kept in constant tension by suitable clamping devices. The belt drum is mounted on a tube guided in ball bearings, and inside of it is a rod, the upper part of which is securely fastened to the tube, the lower end being firmly attached to the frame of the machine. It will thus be seen that when the belt drum is rotated, the rod inside of the tube is in torsion, and this resistance forms part of the total resistance of the machine, and is a constant for the same travel of the recording pen. To the upper end of the tube are secured two radial arms, the extreme ends of which are finished to a circle having its center at the center of the tube. The angular motion at the end of one arm imparts straight line motion to a carriage, guided by a grooved track and carrying the recording pen. The opposite arm is coupled by steel belts to a rotary oil dash pot, to reduce violent oscillations of the recording pen, the extent of which can be controlled as desired. The principal resistances in the dynamometer are flat springs, placed under the second levers and deflected by the motion of these levers. There are three sets of these springs, varying in resistance so that a travel of 8 in. of the recording pen corresponds to a drawbar pull of either 80,000 lbs., 40,000 lbs., or 16,000 lbs., as may be desired. The drawbar pull is traced upon a strip of paper 18 in. wide, made to travel at a known rate for each mile run by the locomotive, and this will form the permanent record of the drawbar pull in each test.

The yoke and drawbar of the dynamometer can be adjusted vertically through a range of 12 in. by means of a wheel "H," in order that the different heights of locomotive drawbars can be accommodated.

The smoke from the locomotive will be carried out of the building by a stack, which can be moved, and the lower portion of which will be made telescopic, so that it can be raised and lowered for adjustment, and permit the passage of the electric crane, when necessary. The stack has deflectors, so that the sparks discharged by the locomotive can be caught, weighed and form a part of the data obtained. The instruments necessary to get full information for the tests, will consist, in addition to the dynamometer, of steam engine indicators, gages for steam pressures, draft gages for smoke-box, fire-box and ash-pan, thermometers for temperatures in the smoke-box, calorimeters for getting the quality of the steam, a revolution counter and a tachometer for showing the speed in revolutions per minute.

Means for bringing the locomotive safely to its position on the plant form a most important part of the installation. The supporting wheels having been placed in position corresponding to the spacing of the drivers, I beams resting on the supporting shafts, and extending the full length of the pit, will be bolted securely to the inside faces of the supporting wheels. Supports at the ends of the pit and at as many intermediate points as may be necessary will be provided. On the upper flange of the I-beams is riveted a grooved rail, so located that the flanges of the driving wheels will run in this groove; in other words, the locomotive will be moved to its position on the plant by being run on the flanges of its driving wheels, leaving the treads free to come into position upon the supporting wheels. When in place, the special rails and I-beams will be disconnected from the supporting wheels and removed, so as not to interfere with the operation of the plant. Provision will also be made for taking care of the driving wheels without flanges, which will be run over the same grooved rails, the grooves being filled by a suitable section of rolled steel.

Vanderbilt 50-Ton Steel Flat-Car.

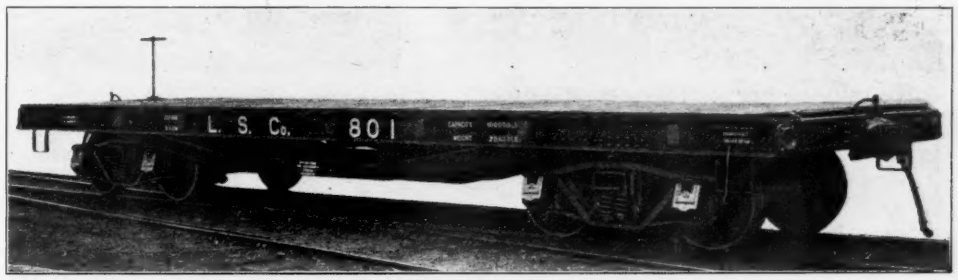
The Lackawanna Steel Company has in service a number of Vanderbilt steel flat-cars built by the South Bethlehem Steel Car & Foundry Company. These cars are made entirely of structural steel, with the exception of the floor, which is wood. The side sills are 10 in. channels with the flanges placed outward. Each sill is reinforced by a 6-in. channel riveted to the back, the lower flange of the 6 in. channel being flush with the lower flange of the 10 in. channel. The sills are also tied together by angle frame braces on which are bolted the oak floor stringers. The needle beams are 8 in. channels fastened to the top and bottom members of the sills by heavy angle braces strengthening the car laterally. The body bolsters are built in three sections of cast steel with a 12 in. x ¾ in. steel cover plate riveted through the top flanges of the sills and bolster castings. The end sill is made of ⅜ in. plate.

The special feature of these cars is the sill construction whereby any desired strength can be obtained by deepening the sills, thus increasing the moment of inertia. On account of absence of metal about the neutral axis of the sills, this car is very light. The car was designed to carry a uniformly distributed load of 100,000 lbs. between bolsters or a concentrated load of 55,000 lbs. between needle beams. They are equipped with Tower couplers having M. C. B. 5 in. x 7 in. shank, New York air-brakes, Sessions-Standard friction draft gear, Vanderbilt brake-beams, Atha cast steel bolsters, and grey iron journal boxes and brasses made by the car builders.

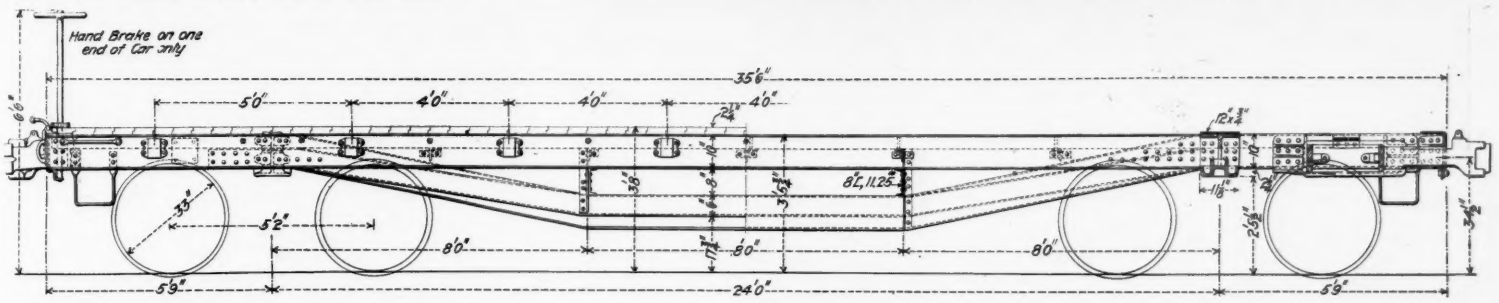
The principal dimensions of the car follow:

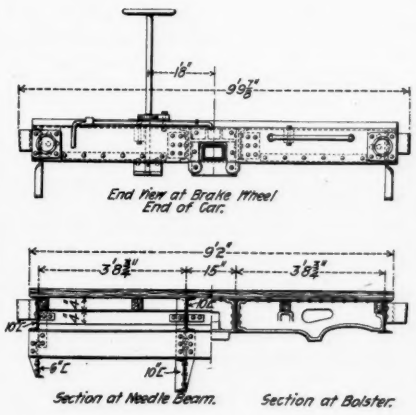
Light weight	28,650 lbs.
Length over end sills	35 ft. 6 in.
Width over side sills	9 ft. 2 in.
Width over side stakes	9 ft. 9⅞ in.
Center to center of trucks	24 ft. 6 in.
Distance between center sills	1 ft. 3 in.
Height from top of rail to top of brake shaft	6 ft. 6 in.
Height from top of rail to top of floor	3 ft. 8 in.
Height from top of rail to center of coupler	2 ft. 10½ in.
Height from top of rail to body center plate	2 ft. 5½ in.

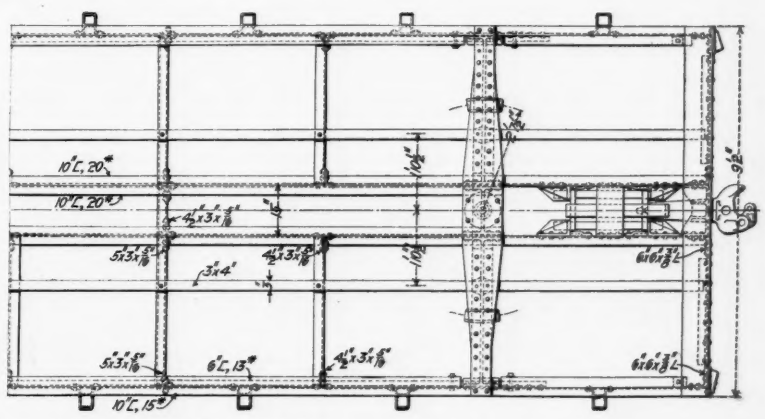
The car is patented by Cornelius Vanderbilt and the design and construction was supervised by L. A. Shepard.



Vanderbilt 50-Ton Steel Flat-Car.







Vanderbilt 50-Ton Steel Flat-Car.

Railroad Station Improvement.

BY MRS. A. E. M'CREA, LANDSCAPE ARCHITECT.

In looking forward to a realization of high ideals in artistic development, it is with difficulty that one overcomes the feeling of discouragement at the slow progress along these lines. However, a glance backward over the last 12 years, to the time of the writer's entrance into the field of landscape architecture, convinces her that wonderful strides have been made, and gives faith in the future. She has seen develop from tiny grass plats, grudgingly permitted by a few railroads, an almost universal system of parks surrounding the railroad stations throughout the country. True, they vary in size and artistic effect in proportion to the appreciation of the value of the work by the railroad managers, since results naturally depend upon the amount of money and skill expended. Not until recently have the services of experienced landscape architects been considered necessary, and many roads still permit their section men to have charge of the work. Comparisons may be odious, but they are nevertheless convincing. A glance at the results of the two methods clearly shows that utility and beauty, to be wisely combined, should be in the hands of persons trained to that special work.

Buildings can be planned artistically at very little more cost than the ugly station so often seen. They can be so grouped that the station proper is the one building in evidence, the others being compactly clustered, in an inconspicuous position, quite hidden by a bank of shrubbery, which by judicious selection and arrangement produces a succession of bloom and ever changing color, and at the same time forms a background for the lawn, which should remain unbroken except for a few shade trees, when space permits. The painting of the buildings is most important, and the selection of colors should be in the hands of an expert, that harmony may result.

Railroad station improvement is in a state of evolution. A retrospective glance shows, first, the little oblong grass plat raised to a height of 3 ft., leveled and terraced with careful precision. This was for a time the station agent's pride. Later a geranium or canna bed in the form of a crescent or star was added, the whole surrounded by a whitewashed fence, producing the deadliest kind of graveyard scene. Next a greenhouse system was organized by some of the companies, and plants were propagated and distributed in quanities about the stations on their lines. That artistic arrangement and color harmony were not

carried out will not appear strange when it is considered that only common laborers were employed. The advantages and economy of planting hardy trees, shrubs and vines, which grow more beautiful with each succeeding year and require no transplanting, are rapidly leading to the extermination of the monotonous, inartistic and expensive greenhouse planting.

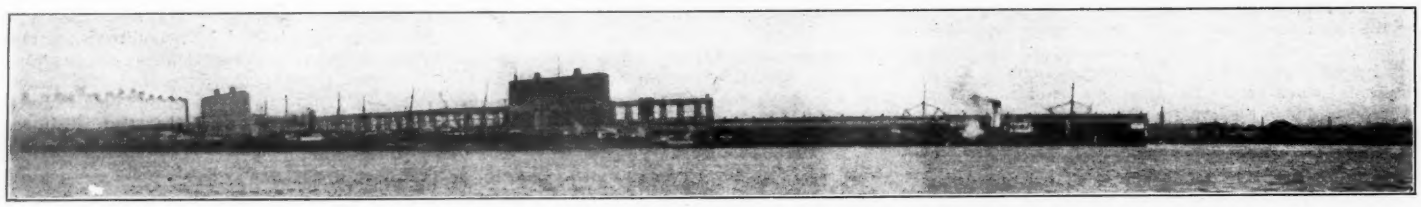
The Boston & Albany gives fair examples of thoroughly artistic work; the Chicago & North Western and Michigan Central follow next. The Chicago, Milwaukee & St. Paul has done more than any other system in the country in a short space of time, having parked and planted hardy shrubbery at over 200 stations in two years. The selection of paint has also been placed in the hands of a landscape architect. The Chicago, Rock Island & Pacific has built some handsome stations in the last few years, and it is the custom to place the grounds for new buildings in the hands of a competent person for arrangement, but no such general improvement work as undertaken by others mentioned has been done. The Chicago & Alton this spring began a thorough renovating of its Chicago-St. Louis line, having placed the paint selection, parking, and planting of 50 stations in the hands of a landscape architect. This much will be done at once, and more will follow. The roadbed of the Alton is excellent and its rolling stock and equipment in first rate condition, but hitherto its stations have been neglected. The improvements now in progress will bring them more nearly in harmony with the equipment and roadbed. To attempt any further description of this work than has been given in a general way in the foregoing would require that each station be treated in detail, since each is a separate problem. Inspection was made in the latter part of the winter, since which time a wholesale moving of secondary buildings, curbing, filling and grading has been in progress. Painting of buildings and planting are now proceeding, and it is expected to have the work completed by June.

The Stuyvesant Docks at New Orleans.

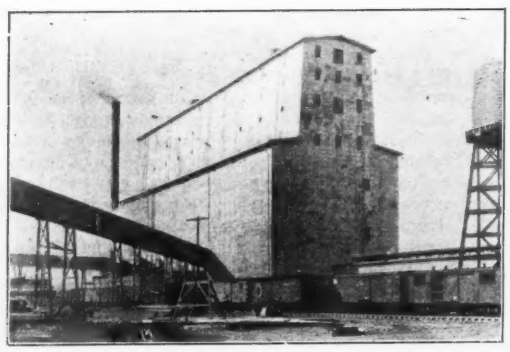
It is only a few years, comparatively, since it was customary for the trunk lines to regard as quite unimportant the position of the Gulf ports in the grain export business, and the statement was frequently made that there were no proper export facilities except in connection with the ports on the Atlantic; but within the last few years Galveston and New Orleans have been gaining traffic far more rapidly in proportion than has New York, Boston, Philadelphia, or Baltimore, and the grain exporters, in New York particularly, have become greatly concerned about the diversion of traffic to the Southwest. Geographically, a very large and important grain area in the Southwest is directly tributary to the Gulf ports, and the principal feature of Illinois Central improvement work, which has been described rather fully in previous issues of the *Railroad Gazette*, has been to furnish a double-track, low grade line direct from Chicago to the Gulf with a special view to handling through traffic with facility in large train loads. As a north and south line the Illinois Central has a peculiar advantage in that it can secure full train loads in both directions, the principal hauls south being grain, coal and export stuff and the principal hauls north being lumber, fruit, cotton and import stuff, in addition to which considerable coal is hauled locally into Chicago. The steamers which come to New Orleans for grain, naturally find it to their advantage to bring cargoes there, and so the profits from the establishment of an important export business are double. Some of the special features of this northbound traffic brought to the docks at New Orleans by steamer were described in the issue of the *Railroad Gazette* of August 28, 1903; as, for example, "the banana expresses," which run special from New Orleans to Chicago, 923 miles, on a 33-hour schedule, when the bananas are required in the market immediately. This is only about 8 hours slower than the fast passenger schedule. The accompanying photograph, which is reproduced from that issue, shows one of these trains, made up of 34 cars, carrying 433 tons of fruit net.

Simultaneously with the grade revision, and other improvements to the line, the dock facilities at New Orleans were taken in hand, and the present Stuyvesant docks were developed. These docks extend westerly from Louisiana avenue, New Orleans, up stream along the Mississippi river to Napoleon avenue, a distance of about 4,700 ft., with deep water along their entire length for vessels of the largest type, which come to New Orleans, and extremely convenient yard and grain elevator facilities in the rear. The docks have added greatly to the possibilities of New Orleans as an export point, and now constitute the American terminus of a number of regular steamship lines to foreign ports, in addition to the large charter fleet which calls there. The structures and yard tracks behind the dock occupy a space of from 500 to 1,000 ft. wide, and run the entire distance.

About 2,100 ft. of wharf was built west from the westerly end of Louisiana avenue in 1896. This was extended approximately 1,350 ft. in 1901, and the remaining distance of about 1,250 ft. was completed in 1903. It will be observed that the slips do not extend out into the



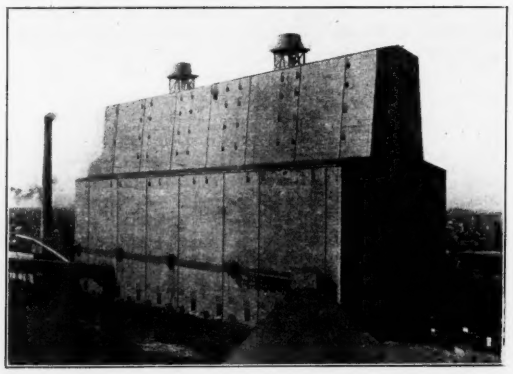
General View of Stuyvesant Docks, Mississippi River, at New Orleans.



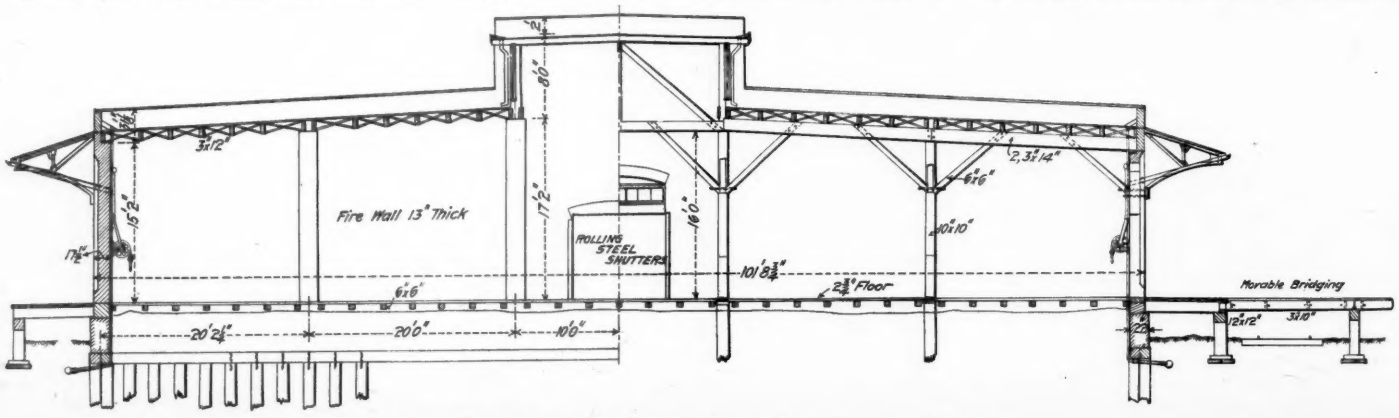
Elevator "D," 1,500,000 Bu. Capacity.

General View of Docks, Showing Elevator "D."

Rear of Stuyvesant Docks.



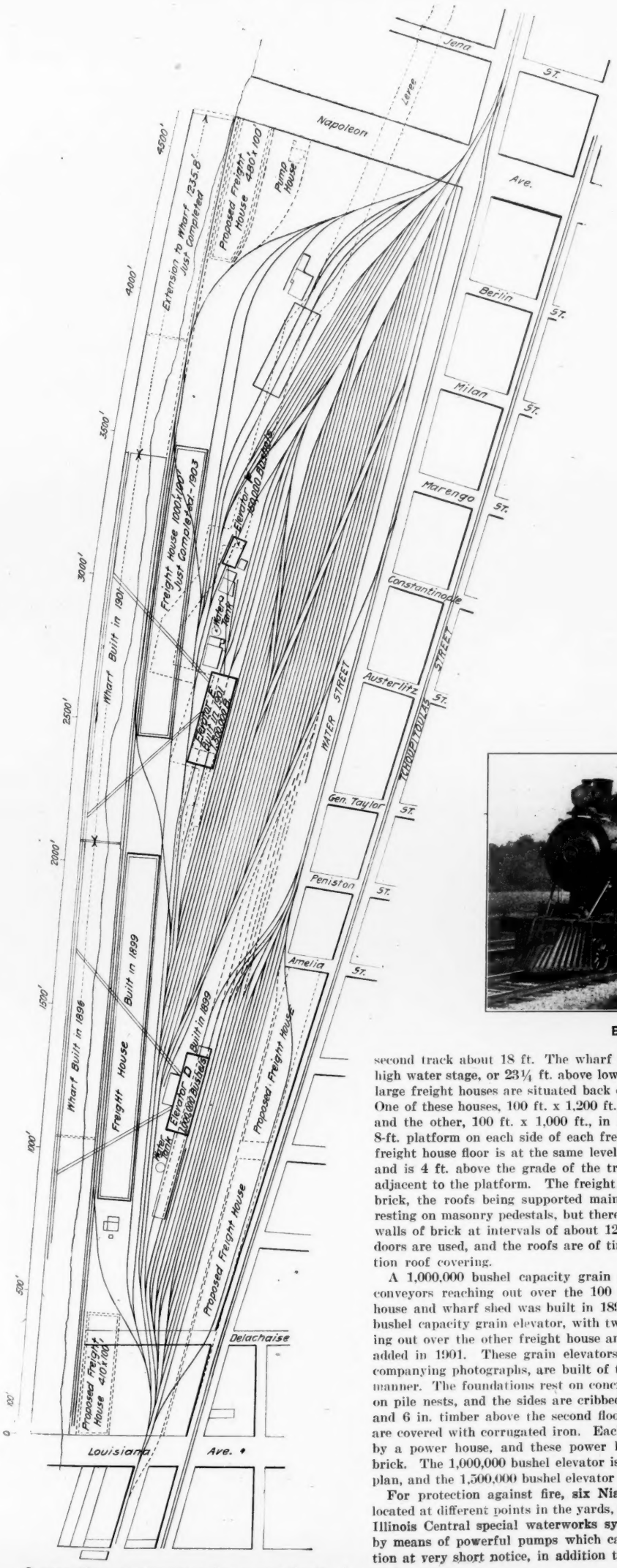
Elevator "E," 1,000,000 Bu. Capacity.



Cross Section to Show Construction of Shed, Stuyvesant Docks.

stream, but vessels lie end to end along the wharf, parallel to the direction of the river.

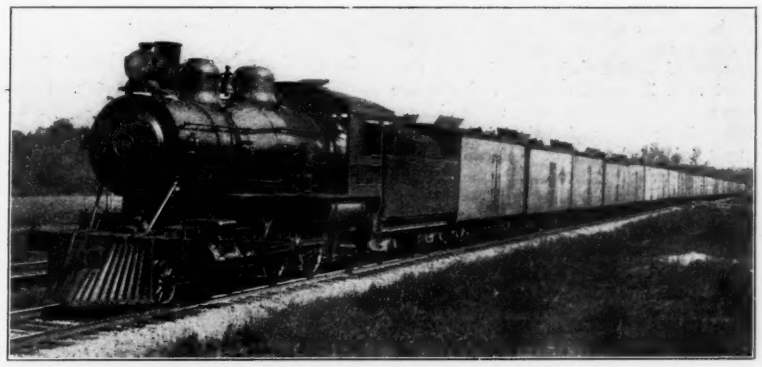
The wharf is supported by piles, spaced 10 ft. center to center in each direction, capped longitudinally by 12 in. x 12 in. timbers, these supporting the floor of 4 in. x 12 in. joists and 3 in plank. A receiving, delivering and storage yard covers the whole width of the wharf, 152 ft., except for a 5 ft. platform on the river side and a 10 ft. platform in the rear. Adjacent to the latter are two of the yard tracks at a grade 4 ft. below the level of the wharf or shed floor, the center of the nearest track being about 6 ft. from the edge of the platform, and that of the second track about 18 ft. The wharf floor is 7 ft. above high water stage, or 23¼ ft. above low water stage. Two large freight houses are situated back of these two tracks. One of these houses, 100 ft. x 1,200 ft., was built in 1899, and the other, 100 ft. x 1,000 ft., in 1903. There is an 8-ft. platform on each side of each freight house, and the freight house floor is at the same level as the wharf floor, and is 4 ft. above the grade of the tracks on either side adjacent to the platform. The freight houses are built of brick, the roofs being supported mainly by timber posts resting on masonry pedestals, but there are transverse fire walls of brick at intervals of about 120 ft. Rolling steel doors are used, and the roofs are of timber with composition roof covering.



General Plan of Stuyvesant Docks and Yards.

A 1,000,000 bushel capacity grain elevator, with two conveyors reaching out over the 100 x 1,200 ft. freight house and wharf shed was built in 1899, and a 1,500,000 bushel capacity grain elevator, with two conveyors reaching out over the other freight house and wharf shed, was added in 1901. These grain elevators, shown in the accompanying photographs, are built of timber in the usual manner. The foundations rest on concrete pedestals built on pile nests, and the sides are cribbed with 10 in., 8 in. and 6 in. timber above the second floor. The structures are covered with corrugated iron. Each elevator is served by a power house, and these power houses are built of brick. The 1,000,000 bushel elevator is 83 ft. x 284 ft. in plan, and the 1,500,000 bushel elevator is 100 ft. x 330 ft.

For protection against fire, six Niagara hydrants are located at different points in the yards, connected with the Illinois Central special waterworks system, and supplied by means of powerful pumps which can be set in operation at very short notice, in addition to the regular pressure.



Banana Express, New Orleans to Chicago.

Firing Locomotives.

BY F. R. WADLEIGH.*

During an experience of a number of years in the handling of coal in different kinds of service, the writer has often been struck with the lack of good "working" instructions to firemen, written in language clear and plain enough to be easily understood by the average fireman, and, more especially, by the young man who is just beginning to learn how to handle the "scoop." Such instructions, in addition to being written in clear language, should not go into the chemistry of combustion, but should deal more particularly with the actual work that the fireman has to do. Leaving aside other duties not actually pertaining to the firing, the main thing to be impressed upon the locomotive fireman is that he is to keep up an even, steady pressure of steam with the minimum amount of coal with little waste of steam, with the smallest possible amount of smoke, and with few ashes and clinkers.

The following instructions have been written with the above ends in view; and while it is practically impossible to give rules that will cover every method and point concerned in burning coal on locomotives, it is believed that the most important and vital points have been sufficiently covered.

1. Before going into yard to couple to train, see that all the firing tools are on the engine and in good order; examine the grates, see that they are in good condition and that both grates and ash-pan are clean.

2. If fire has been banked, shake the grates before spreading the fire, so as to have the grates as clean as possible when starting.

3. While waiting in yard, keep the ash-pan dampers closed. Do not allow engine to blow off, and try to make as little smoke as possible. It is not necessary to get a hot fire in your engine until a short time before your train is to leave. But always try to get your engine hot gradually, as this will not be so hard on flues and fire-box as getting up steam quickly.

4. Before starting, the blower should be put on and a good, solid fire of well-burned coal be made ready for the start. When building up the fire, the door should be left partly open—as far as the first notch on the catch—until smoke disappears.

5. After leaving a station or stop of any kind, do not open the fire-box door to throw coal on or hook the fire until the reverse lever is hooked back. If firing is begun as soon as the throttle is opened, and when engine is working hard, a great deal of cold air will be drawn into the fire-box and against the flues. This is not only hard on the flues and sheets, but is apt to cause steam pressure to fall. There should be enough coal on the fire before starting to avoid this.

6. Do not throw on the fire at one time more coal than is absolutely needed. Two or three shovelfuls at one time should always be enough; and generally one will be enough with careful firing.

Always see where coal is needed before it leaves the shovel.

Do not fire aimlessly.

More coal is wasted by unnecessary firing than in any other way. There is a great deal of heat lost by firing too much at a time and at too long intervals. As little coal as possible at a time, firing often, and putting coal just where needed, will give more steam and use less coal. By putting a large amount of coal in the fire-box at a time heat is wasted, as the supply of air needed cannot mix with the coal fast enough to burn it properly.

Actual tests have shown that from 8 to 10 per cent. better results were obtained by firing 13 lbs. at a time instead of 55 lbs.

7. Always try to keep down smoke as much as possible. When steam is about to be shut off, open door a little just before the throttle is closed, and, if necessary, put on blower a little.

When using steam, smoke can be prevented by keeping a white heat, firing a little at a time, and holding the door open about an inch for a few seconds after firing. But the fire-box should never be left wide open, especially when using steam or when the blower is on.

8. Do not allow steam to blow off if it can possibly be avoided. Steam blowing off means a waste of coal, water and labor. It can nearly always be prevented while using steam by watching the gage closely as well as the handling of the engine, by closing a damper and

*Chief Inspector, Castner, Curran & Bullitt Co.

opening door on the latch before the pop valve raises. Try to keep the fire so that the steam pressure will vary as little as possible. By doing so the engine will use less coal and there will be less strain on the fire-box and boiler, owing to the temperature being more even. While on side tracks or at a long stop, both dampers should be kept closed. But when steam is shut off and the injectors are on, the fire should not be allowed to burn down too much while injectors are working, especiallly with a leaky engine.

9. Always carry as light a fire as possible, as by doing so more heat can be obtained from the coal than with a heavy fire. It takes a certain amount of air to mix with a quantity of coal so as to get out of the coal all of the heat there is in it. If a very heavy fire is carried it will be difficult to get sufficient air through the fire to enable it to mix thoroughly with the gases.

Keep the fire free from holes, especially next the fire-box sheets. That part of the fire nearest flue sheets should always be carefully watched, as cold air coming up through the grates at that point will do more to cause steam to fall than any other one thing, besides being hard on the flues. This is especially the case where brick arches are used.

The unpleasant noise sometimes made when standing still or running with a light, clean fire, known as "drumming" should always be prevented. This is caused by a series of minute explosions of oxyhydrogen gas, due to having a hole or holes in the fire, and can be stopped by closing dampers or filling up holes.

10. Keep the flame of a bright white color all over fire-box if a hot fire is desired, especially in front of fire-box. Watch the fire closely, see when the flame is brightest, with least amount of smoke, and try to keep it that way. As a general rule, it may be stated that the fire that will make the most steam is the most economical.

11. Do not throw large lumps of coal in the fire-box, but break them up to about the size of half a brick, the reason for this being that so much more surface of the coal is exposed to the fire and that the combustion is more rapid. Besides, throwing a large lump of coal in the fire-box will make a bad spot in the fire. The broken up lumps and fine coal should be mixed together as much as possible before firing. All coal should be carefully watched and any foreign substances that might cause the fire to get dirty thrown aside.

12. Do not stir the fire except when absolutely necessary, as stirring the fire unnecessarily may help to form clinkers by mixing small pieces of fusible ash together, and it also wastes coal by causing the smaller particles to fall through the grates. If you see that the fire needs hooking, do it at once, and do not wait until steam pressure falls because the fire is not in proper condition. Usually, when the fire needs stirring, the result to be accomplished is to have the fire level—not black in one place and bright in another, but showing the same white heat all over. This can be done best by using a two pronged hook and running it over the top of the fire.

13. Have the ash-pan dampers kept in order, and pay strict attention to their proper use. Always bear in mind that these dampers regulate the supply of air for the fire and that a proper amount of air is required just as much as a proper amount of coal, as coal will not burn without air The dampers should be kept closed when the engine is not using steam, whether standing still or running, and whenever you shake the grates. Regulate the supply of air according to the condition of the fire; a clean, light fire will not require as much air as a thick or dirty one.

14. Grates should be shaken only when absolutely necessary; and the best time to do this is when steam is shut off, or when the draft through the fire is lightest. They should not be shaken too hard, as the object to be accomplished is merely to shake ashes into the ash-pan and away from the grates so as to give more air to the fire. Unnecessary shaking of grates will cause a loss of fuel, and partly burned coal falling into the ash-pan is liable to warp it. Ash-pans should be examined frequently and should not be allowed to fill up.

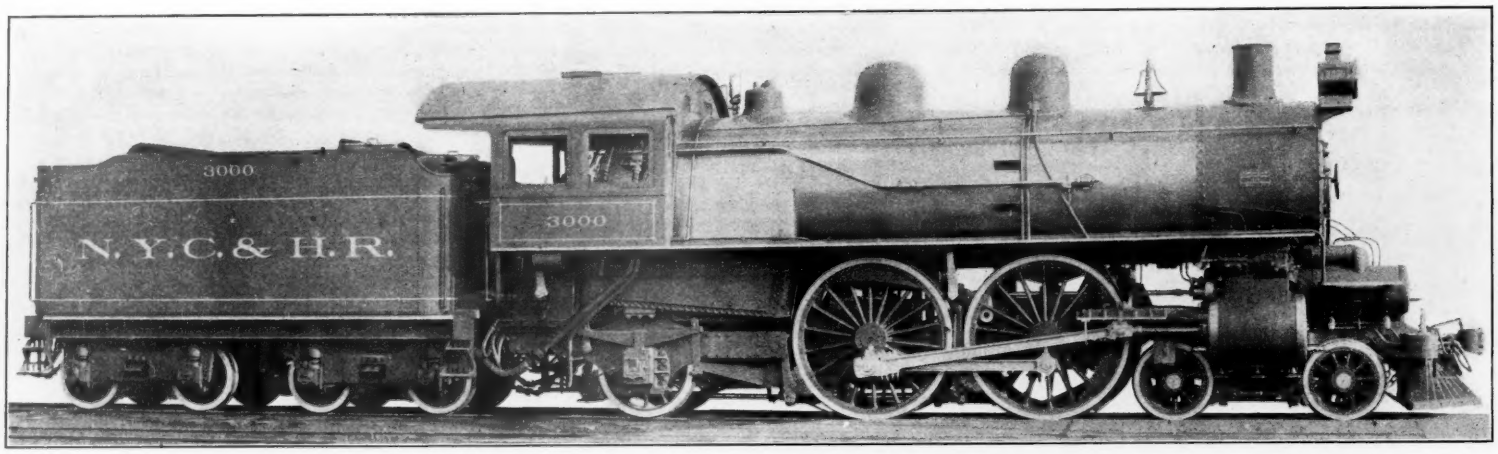
15. It is generally thought to be a good plan to keep the coal moist, especially where there is much fine coal. This not only prevents dust from flying around, but also keeps the fine coal from being drawn through the flues before it strikes the fire. The coal will also coke better and will not burn out so quickly.

16. The engineman should handle the water supply so that the fireman can fire the engine regularly and with economy. The best method of doing this is to supply water continuously and as regularly as possible; but the injector should never be left on when starting. The fireman should watch closely the way in which the engine is handled, especially the injectors, so as to regulate his firing accordingly. Before coming to a heavy pull, get the fire in shape in plenty of time; do not keep a light fire until you start for the hill, and then try to get a heavier fire while the engine is being worked hard.

17. The fireman should always arrange to do his firing either on a straight piece of track or on a curve towards the engineman's side, so that when going around a curve on which the engineman cannot see ahead the fireman can do the looking out. Always keep a sharp lookout ahead when not firing.

18. The fireman should try to keep up an even, steady pressure of steam with the smallest amount of coal possible; and both he and the engineman should work together to bring about this result.

19. In order to get the best results it is necessary to pay close attention at all times to the condition of the fire. Every time the fire door is opened, look over the fire and note any change in its condition. If the steam pressure varies, there is always a reason for such change, and the fireman should try to find out what caused it.



Cole's Four-Cylinder Balanced Compound Locomotive for the New York Central.

Cole's Four-Cylinder Balanced Compound Locomotive for the New York Central.

The locomotive shown herewith was built by the Schenectady Works of the American Locomotive Company from the designs of Mr. F. J. Cole. The locomotive is similar in many respects to the well known de Glehn-de Bousquet type of the Northern of France. It has been the purpose of the designer of this new locomotive to incorporate as many of the good features of the de Glehn engine as possible, and yet do away with many of the complications, which, to American practice, seem unnecessary. The engine has been purchased by the New York Central and after being exhibited at St. Louis, it will be given a thorough trial in regular service. Some service tests have already been made and heavy 13-car trains have been successfully hauled at high speed without overtaxing the capacity of the locomotive.

This new engine has two high pressure cylinders between the frames set a little forward of the smoke-box. These cylinders drive on the forward axle, the cranks being set quartering. The outside cylinders are low-pressure and drive on the second driving axle. Each outside crank is set 180 deg. with its adjacent inside crank. This arrangement makes necessary the use of shorter connecting rods on the inside than on the outside. In the de Glehn engine the high pressure cylinders are outside of the frames and are carried back on the frame so that an outside connecting rod is no longer than an inside connecting rod. The de Glehn engine also has independent reversing gear for each cylinder, whereas the valve gear of the Cole engine is the same as that for a simple engine. The Cole valve is the piston type and is in general similar to that used by the Schenectady Works for its tandem compounds. That is, the high pressure and low pressure valves on one side are on the same valve stem, the steam passing through the valves on its way from the high pressure to the low pressure cylinder. The Vauclain balanced compound (see *Railroad Gazette*, June 22, 1904), has all four cylinders in the same vertical plane, the high pressure cylinders being inside the frames as in the Cole engine. All four cylinders, however, drive on the forward axle, thus making all connecting rods the same length. In the Vauclain design one valve serves each pair of high and low pressure cylinders.

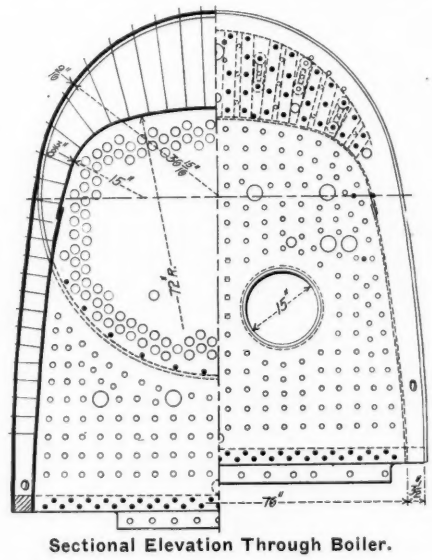
The principal dimensions of the de Glehn, Vauclain and Cole Atlantic-type locomotives are given by the following table. The de Glehn engine is the latest design for the Northern of France (see *Railroad Gazette*, Oct. 10, 1902). The Vauclain engine was built for the Santa Fe last year.

	de Glehn.	Vauclain.	Cole.
Total weight, lbs....	142,193	193,760	200,000
Wt. on drivers, lbs..	71,200	101,420	110,000
Cylinders, in...	13.4 and 22x25.2	15 and 25x26	15½ and 26x26
Diam. of drivers, in..	80⅜	73	79
Total heating surface, sq. ft.	2,274	3,083	3,446
Grate area, sq. ft....	29.6	49.5	50.3

The Cole engine is the heaviest of the three. The ratio of the weight on drivers to total weight is .50, .52 and .55 for the de Glehn, Vauclain and Cole locomotives respectively. The weight on one driving axle of the Cole locomotive is 55,000 lbs., which is 5,000 lbs. more than that usually considered as the limit and, indeed, but few roads allow that much. Owing to the almost perfect balance which is obtained by the four-cylinder arrangement, the New York Central readily acceeded to 55,000 lbs. on one axle owing to the absence of the "hammer blow" at high speeds.

A general description of the Cole engine follows:

Kind of fuel to be used.....Bituminous coal
Weight on drivers.....110,000 lbs.
Weight on truck wheels..... 90,000 lbs.



Sectional Elevation Through Boiler.

Weight, total .....200,000 lbs.
Weight, tender loaded.....121,600 lbs

General Dimensions.

Wheel base, total, of engine.....27 ft. 9 in.
Wheel base, driving..... 7 ft. 0 in.
Wheel base, total (engine and tender).....53 ft. 8 in.
Height of stack above rails.....14 ft. 8 in.
Heating surface, fire-box.....175 sq. ft.
Heating surface, water tubes.....23 sq. ft.
Heating surface, tubes.....3,248 sq. ft.
Heating surface, total.....3,446 sq. ft.
Grate area .....50.3 sq. ft.

Wheels and Journals.

Drivers, number.....4
Drivers, diameter.....79 in.
Drivers, material of centers.....Cast steel
Truck wheels, diameter.....36 in.
Journals, driving axle, size.....10 in. x 12 in.
Journals, truck axle, size.....6½ in. x 12 in.
Main crank pin, size.....6 in. x 6 in.

Cylinders.

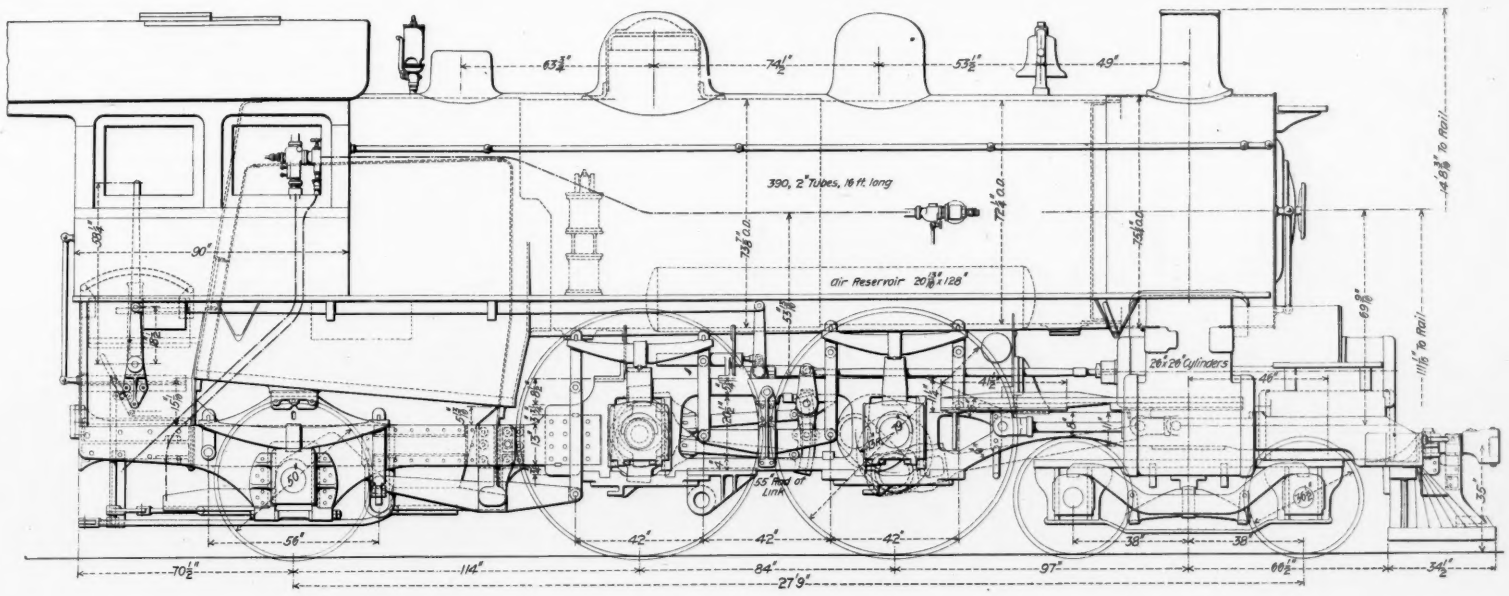
Cylinders, diameter.....15½ in. and 26 in.
Piston, stroke.....26 in.
Piston rod, diameter.....3 in.
Kind of piston rod packing.....Cast iron ring

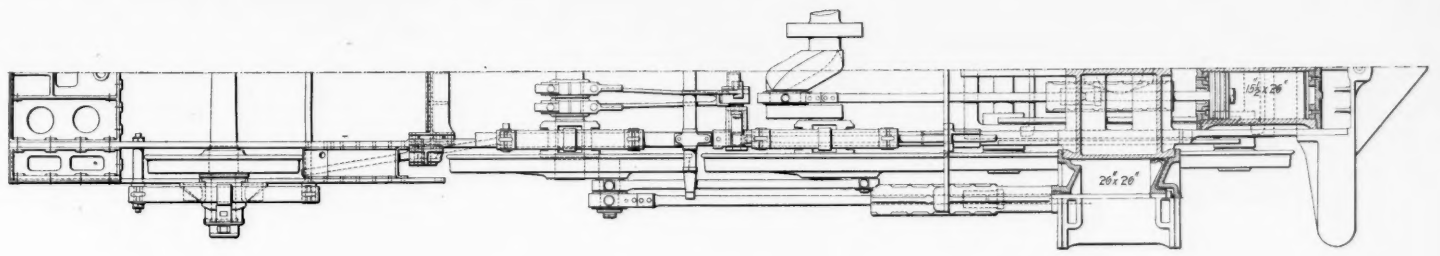
Valves.

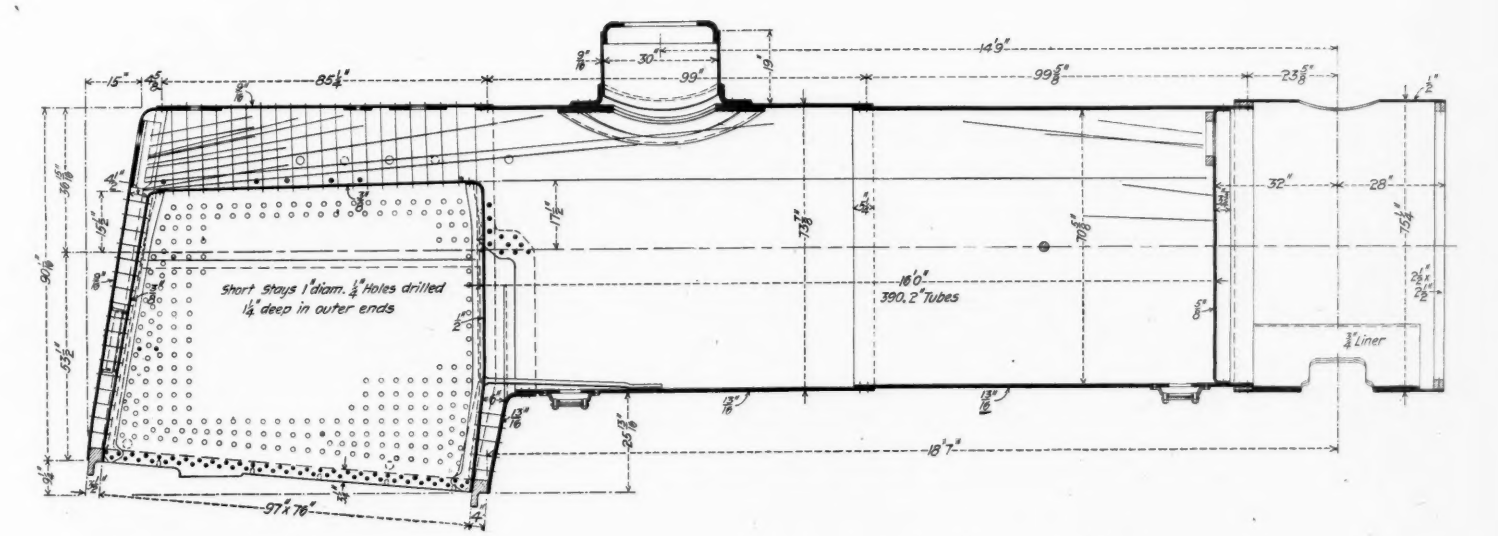
Kind of.....Piston
Greatest travel.....6 in.
Outside lap.....1 in.
Inside lap or clearance.....H. P., ¼ in.; L. P., ⅜ in.
Lead.....¼ in. forward at 11 in. cut off

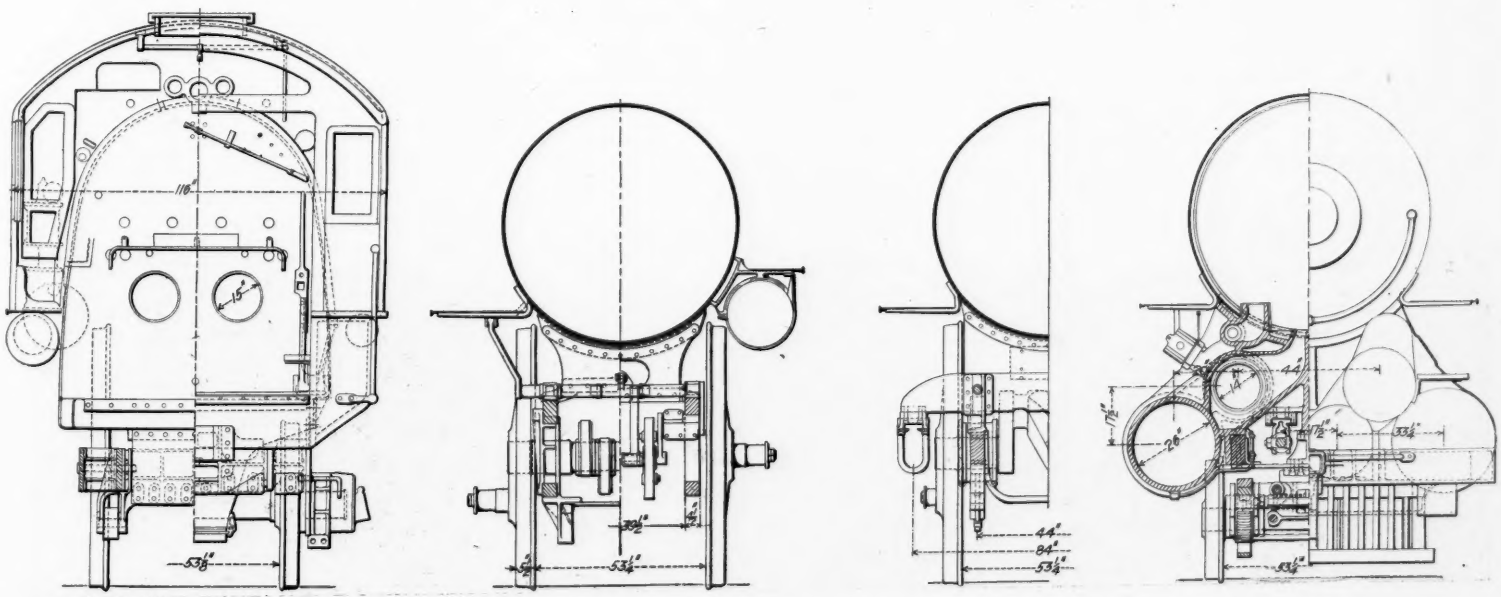
Boiler.

Type of.....Straight top
Working steam pressure.....220 lbs.









Cole's Four-Cylinder Balanced Compound Locomotive for the New York Central.

Material in barrel	Worth steel
Thickness of material in barrel	13-16 in.
Diameter of barrel, first ring	72¼ in.
Seams, kind of horizontal	Butt joint, sextuple riveted
Seams, kind of circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheet	⅜ in.
Crown sheet stayed with	Radial stays
Fire-box.	
Length	96⅛ in.
Width	75¼ in.
Depth front	80¼ in.
Depth back	69 in.
Material	Carbon steel
Thickness of sheets	Sides, ⅜ in.; back, ⅜ in.
Water space, width	Front, 4 in. and 5 in.; sides, 3½ in. and 5½ in.; back, 3½ in. and 4½ in.
Grate, kind	Rocking in 4 sections
Tubes.	
Number	390
Material	Charcoal iron
Outside diameter	2 in.
Length over sheets	16 ft. 0 in.
Other Parts.	
Exhaust nozzle, single or double	Single
Exhaust nozzle, diameter	5⅝ in., 5⅝ in., 5⅞ in.
Stack, straight or taper	Straight
Stack, diameter	18 in.
Tender.	
Tank capacity	6,000 gal.
Coal capacity	10 tons
Type of truck	Fox pressed steel
Diameter of truck wheels	36 in.
Diameter and length of axle journals	5½ in. x 10 in.

The St. Louis Terminal Improvements.

In the *Railroad Gazette* for March 20, 1903, a description was printed of the improvements at the St. Louis terminal, which was rearranged to provide improved and increased facilities for handling the very large business, especially that brought by the World's Fair. The accompanying photographs show the rearrangement of two three-track leads, and the rectangular signal bridge at their intersection.

Foreign Railroad Notes.

An odd accident occurred near the old Ziovi Tunnel (not far from Genoa) last March. A freight train of 36 cars to which was attached four returning helper locomotives, besides the one drawing it, was passing through the tunnel and down the very steep grade which leads to it, when it parted between the eleventh and twelfth cars. The automatic brakes held the rear part, while the rest proceeded to the next telegraphic station and halted there according to the rules. But the brakemen on the rear section could not see that the train had parted, on account of the smoke in the tunnel; and thinking that the whole train had stopped because of too much braking on the grade, they let the brakes off. Thereupon the cars naturally ran down the grade at great speed and into the waiting front part, with much shattering of cars but no serious injuries to the men.

Drilling was resumed at the north end of the Simplon Tunnel March 22, after a suspension of three months, due to the vein of water struck. The progress during March was 494 ft. at the south end and 97 ft. at the north end. The distance remaining is 4,448 ft.

Air-Brake Association.

The annual convention of the Air-Brake Association was held at Buffalo, N. Y., Tuesday, May 10. Abstracts of some of the reports and papers follow:

ELECTRIC CAR AND TRAIN BRAKES.

By S. J. Kidder.

When street cars were light in weight and slow in speed, no special demand was apparent for power brakes; but with the advent of heavier cars, faster speed, and a very considerable factor of rotative energy from the revolving armatures acting as a driving force, or power to propel the car when the trolley current was cut off, it was imperative to provide all electricallly driven cars with the most efficient means for controlling their speed, as well as to bring them to a stop in the shortest possible distance. That the importance and value of such braking devices has been realized is apparent from the number, and different types, of brakes that have been brought out since the adoption of electric power for operating cars and trains.

The friction brake does not appear of sufficient importance to demand extended consideration, not much having been demonstrated in its favor, it appearing that first cost is about the only thing to invite its serious attention, and it will never attain standing as a power brake in connection with motor-driven cars.

Hydraulic brakes have been experimented with and used to some extent, and, while they exhibit no little ingenuity on the part of the inventors, have not proven sufficiently meritorious to find a field of prominence as a power brake in electric car braking.

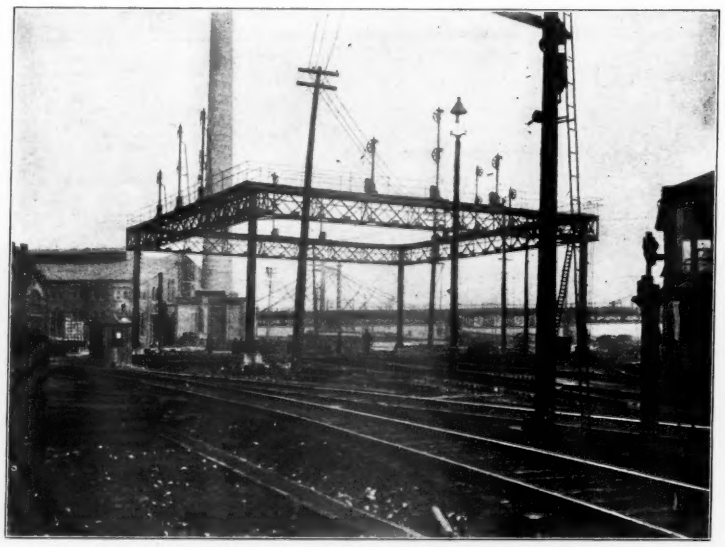
Next in order comes the compressed air-brake, which is being rapidly introduced on motor-driven railroad cars. Unlike the steam roads, however, we find that in connection with street or electric car braking, straight air can, in many instances, be profitably employed, particularly where the motor car is operated without trailers, such as is usually the practice on street and surface roads.

The straight air-brake is of the usual form, having one or more main reservoirs, a brake cylinder, in which the air exerts its energy in applying the brakes through the foundation brake gear usually employed in air-brake practice, one or two engineers' brake valves, or more properly speaking, motorman's brake valves, and an air gage denoting main reservoir and brake cylinder pressure --the above arrangement being common to the three types of brakes known as storage, axle-driven and motor-driven systems.

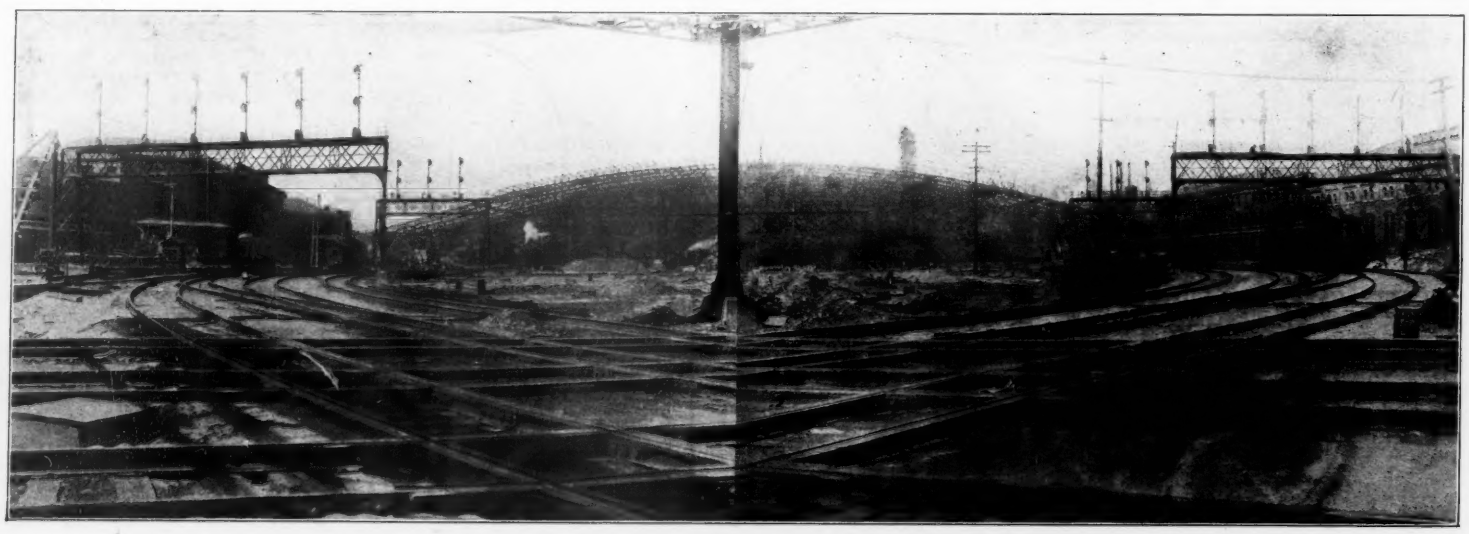
With the storage system one or two main reservoirs of liberal capacity are used, the same being charged at a central storage plant to a pressure of from 275 to 300 lbs., the plant being able to replenish the car reservoirs through suitable hose provided with couplings for convenience in making the connections, in from 10 to 15 seconds. These storage system cars also usually have a smaller reservoir, perhaps 12 in. x 33 in. between the main reservoirs and brake valves, this smaller reservoir furnishing an abundance of air for an emergency application of the brake quite independent of the somewhat restricted capacity of the reducing valve to quickly supply the air required. Interposed between the pipe connecting the storage and reservoir is the reducing valve, just referred to, set at the maximum pressure intended to be permitted in the brake cylinder, thus providing a safeguard against the motorman, subjecting the brake cylinder to a higher pressure than intended. A further provision is a safety valve in the low-pressure reservoir adjusted somewhat higher than maximum brake cylinder pressure to prevent abnormal accumulation of air in the small reservoir in the event of leakage past the reducing valve.

For the axle-driven and motor-driven systems the arrangement of apparatus and stored power is substantially the same as that just described, with the exception that a more moderate pressure is maintained in the main reservoir, the air being furnished from a pump or compressor forming a part of the apparatus on the car. As the name implies, the axle-driven compressor is operated from an eccentric or gear attached to one of the axles. In connection with this compressor there is usually a regulator or governor so arranged that when the maximum pressure intended to be carried in the main reservoir and used in the cylinder has been accumulated, the suction valves are lifted and held from their seats, permitting the pump to run idle or churn until a minimum predetermined pressure has been reached, when the suction valves are dropped to their seats, again throwing the compressors into action. It is apparent that when a car with apparatus, such as just described, is starting out after standing a sufficient time for all the air pressure in the reservoir to become dissipated, it must be run a sufficient distance to produce a pressure competent to operate the brakes efficiently. This is best accomplished by having two reservoirs, the smaller of limited capacity, say 10 in. x 24 in., with a double check valve interposed between this and the larger reservoir, the arrangement being that 30 or more pounds of air may be compressed into the small reservoir before communication is established to the larger one. This provides for a sufficiently prompt rise of pressure in the small reservoir to apply the brakes, which is accomplished by a very few rotations of the car wheels operating the pump. Following this the pressure in both reservoirs increases simultaneously, and on subsequent brake applications air is drawn from the combined reservoirs.

The motor-driven system differs from the axle-driven only in the method of obtaining power to operate the compressors and an absence of the double check valve. The motor-driven air pump is controlled by an automatic governor designed to start and stop the pump at predetermined pressures, usually so constructed that when its operating parts are in normal position the device is "cut in," the "cut out" being effected by air pressure through a small connecting pipe from the main reservoir. At first it may appear somewhat strange that straight air, instead of the automatic brake, is so commonly used in connection with electric car brakes, but because these cars are operated as a single unit the former type of brake has certain features, such as simplicity and promptness in operation, owing to the short cylinder pipe connection between the brake valve and car cylinder, together with the facility and degree of accuracy with which the motorman can increase or decrease the brake cylinder pressure in making stops, and drifting down long hills with varying grades, which makes it especially applicable to this particular form of electric service. An additional



Rectangular Signal Bridge at Crossing of Two 3-Track Lines, St. Louis Union Station.



Terminal Railroad Association of St. Louis—Crossing of the Two Three-Track Leads to the Union Station.

factor pertaining to this type of brake, and of no little importance, is what might be termed the high speed brake feature, it being entirely practical to so manipulate the brake valve that a high initial brake cylinder pressure can be employed, with a gradual or periodical reduction as the speed is decreased, thus contributing to quick stops and the avoidance of wheel-skidding, a valuable desideratum in fast electric car service.

The automatic system of brakes is so widely and extensively used that little is required in the way of description or explanation. The foundation gear is identical to the types of air-brakes already referred to, the only apparatus required in addition to the straight air brake being an auxiliary reservoir and triple valve. With more than one car in a train this brake is preferable to straight air, as in the event of a hose bursting, hose couplings becoming detached, or a disrupted pipe, the brakes are instantly applied automatically; while in similar cases, with straight air, all power control of the brakes is lost. Without question the weakest point in the air-brake system, when more than one car is in the train, is the hose. Used in connection with automatic brakes, they are subjected to the greatest strain when braking power is not desired, while with the straight air brake the maximum strain imposed on the hose is at the time when brakes are set at their highest efficiency, thus having a tendency to invite disaster at the most critical moment.

Within the past decade elevated railroads have attained in our larger cities a very important position as an essential factor in facilitating urban transportation. The earlier of these roads used steam for motive power, the locomotives and cars being equipped with non-automatic vacuum brakes, which, during a considerable period of time, were thought to be superior to other forms of power brakes for the exacting service in elevated railroad operation.

When automatic brakes were first proposed for these roads their adoption was vigorously opposed by both straight air and vacuum brake advocates, among the principal reasons advanced being: Cost; inability of pump to supply the requisite quantity of air; slowness in charging the auxiliary reservoirs, which would render it impossible to restore the depleted pressure with such frequency of stops as elevated service required; slowness of the brake release; and, worst of all, the straining and racking of the elevated structure incident to the use of brakes so quick and powerful in operation. The assertions of these critics, however, failed to materialize and were soon proven fallacious, as is evidenced by the almost universal use of this brake and its highly satisfactory performance in connection with elevated railroad equipment.

It was clearly apparent to those skilled in the art that the automatic brake was, compared to those before used, best suited for this service, as a pump of very ordinary capacity would be capable of supplying air in abundance, and, so far as the expeditious charging of the auxiliary reservoirs and release of the brakes were concerned, the proposition simply resolved itself into that of feed groove and exhaust port area, which, within any limit demanded for such service, in no wise interfered with brake performance on six or seven cars, the maximum number operated on elevated roads.

During the first few years of electrically-operated elevated railroads, trains were composed of one motor and from one to four or five trailer cars, the former containing all the apparatus for producing the compressed air and controlling the brakes; in other words, the motor and trailer cars bore the same relation to each other in this respect as the steam locomotive and train as generally made up, but with the improvements in electrically-operated trains the more modern practice is what is known as the multiple control system, trains being made up with nearly or even all of the vehicles being motor cars. Each car has its full quota of brake equipment, such as pump, main reservoir, governor, brake valves, etc., the main reservoirs throughout the train being in communication with each other through a second line of pipe, hose and couplings, so that when air is drawn from any one reservoir all contribute to supply the air passing through the brake valve, being operated by the motorman. With the system of multiple control an arrangement is necessary to provide for simultaneous operation of the pump governors, that each pump may do its proportionate share of the work, which is accomplished by having either an electric wire or air pipe connection directly between each and all of them.

With either of the types of air-brakes heretofore referred to a higher brake efficiency can be obtained from the motor wheels than from those not connected with the motors, the armatures being connected to the driving wheels through gearing, the pinion of the armature and the gear-wheel on the axle being of such dimensions that the armature makes several revolutions to each turn of the driving wheel. Thus, when brakes are applied, in addition to the usual influences which must be overcome in stopping the train, the high rotative energy due to the rapid rotation of the armatures may also be provided for by an increased braking power without danger of wheel-skidding. Upon the motorman's brake valve and its manipulation depends the satisfactory operation of the automatic brake.

Uniform piston travel on cars running in trains with a minimum travel compatible with proper shoe clearance, whether operated as a single unit or otherwise, is an important matter in connection with air-brakes, such practice contributing to a very considerable economy in the amount of air consumed, wear and tear of the compressors, and manual labor in frequent adjustment of piston travel. As the brake-shoes wear away an increase of piston travel is inevitable, with a consequent decrease of braking power.

Again, the adjustment of piston travel by hand fails to insure a predetermined piston movement when the car is moving, the running travel being an unknown quantity incident to uneven and continuous wear of the brake-shoes, lost motion in the journals, brasses, center plates, spring of the rods, brake-beams, and the varying leverage employed on cars; and it is obvious that nothing but a mechanical device which will automatically regulate the piston travel when cars are running, with the brakes applied, will insure maximum and uniform brake efficiency.

Various types of automatically-operated air-brake slack adjusters, possessing more or less merit, have been invented, but the one embodying the qualities most essential to fulfil the requirements of such a device is operated by air pressure from the brake cylinder. This adjuster mechanically takes up the slack when the wear of the brake-shoes permits the piston to travel beyond the prescribed limit, thus keeping to a uniform travel the brake piston. The brake cylinder piston itself is a valve which, when it passes a predetermined point of stroke, admits pressure through a connecting pipe to the adjuster cylinder, thus pushing out a small piston whose ratchet pawl turns a nut on the adjuster screw, the jaw on the outer end of which is attached by a pin to the fulcrum end of the floating cylinder lever, taking up the slack in the brake rigging caused by the wearing away of the brake-shoes and thereby maintaining a uniform travel of the piston.

Another form of power for brake service which has been experimented with in various types of apparatus, but has only somewhat recently been recognized as a means of promising utility in practical braking, is the electric or magnetic brake. With few exceptions, these attempts have not borne abundant fruit, principally owing to the apparatus failing in one manner or another, together with the danger incident to depending on the trolley pole to maintain its connection with the wire at the time of operating the brakes.

A type of electric brake which has developed some signs of promise has a foundation gear similar to that usually employed in connection with air-brakes, with the exception that it has two cylinders and one cylinder lever. This lever is fulcrumed at the center, has two sheaves attached to it, one at either side of the fulcrum, around which a chain extends, this chain being attached to the end of the two long brake rods extending to the live levers. Each cylinder contains three magnetic coils and a plunger which are directly connected to the cylinder lever outside of the sheaves. Connecting wires lead from these coils to the controller, which is placed alongside the brake staff and geared to it, so that the turning of the brake staff applies the power to the brake. The plungers are simply cylinder pistons actuated by electricity instead of compressed air. With this brake, provision is made that, in the event of the trolley wheel leaving the wire, the motors may be short-circuited through resistance, thus generating the current to operate the brakes, which is accomplished by a further movement of the brake staff handle.

What is known as the magnetic brake is now recognized as a desirable and effective means of utility in practical car braking—desirable because the power employed to operate the brake is generated by the revolving armatures when the trolley current is cut off—and effective because it affords a far greater per cent. of braking force on a car than has been found possible with any power brake heretofore employed. The brake apparatus is a combination of a track brake with the ordinary wheel brake. The track brake consists of a system of brake-shoes combined with powerful electro-magnets beneath the car directly over the rails and so arranged that they not only do not interfere with the efficiency of the wheel brake, but add to its normal retardation. The track brake is placed beneath the two pairs of wheels, and instead of being forced upon the rails through an effort from the car, is drawn to the rails by the electro-magnets above referred to, thereby adding its friction to the unimpaired friction of the wheel brake.

The wheel brake heads, shoes and levers are of the type ordinarily used, the top of the latter being connected by an adjustable compression member, while to the bottom of the levers push rods are secured by pins, their opposite ends also being attached to the track shoes. These push rods are telescopic, so that a movement of the track shoe in a direction opposite to that in which the car is running causes the wheel brake-shoe to be applied to the rear wheel of the truck, and through the truck levers and compression rod, to the forward wheel—a stop on the truck frame between the push rod and the brake head connection preventing the lower end of the forward brake lever from following the track brake-shoe. With an opposite movement of the car the same application of wheel brake-shoe is accomplished in the reverse order.

When the brake is not in operation the suspension springs carry the track magnet and shoes entirely clear of the rails. The frictional resistance of the rails to the movement of the track shoes when the brakes are used causes the wheel brakes to be applied with corresponding force. Thus to the ordinary retardation of the wheel brakes is added that of the track brake and also the back torque of the motors, this combination giving a retarding power to the car far in excess of that possible to be attained when the wheel brake is alone employed. The incidental features of the magnetic brake are also of interest and great value. The current generated by the motors declines with the speed during a stop, thereby offsetting the increased coefficient of friction due to the lower speeds, and, at the same time, prevents the unpleasant lurch experienced when brakes are held applied until the car comes to a full stop.

As will be assumed from what has been said, the brakes release regardless of the brake controller position, but, as in the event of a car starting on a heavy grade, the motors will generate sufficient electricity in a movement of 12 or 15 ft. to again bring it to a state of rest, rendering runaways impossible, even should the motorman apply the brake and then abandon his post. When slippery rails prevail—a prolific source of wheel-skidding—the braking power operating the wheel brakes is correspondingly reduced, so that the force of application of the wheel brake is automatically proportioned to the rail friction which rotates the wheels; but should the wheels pick up and slide, at the same moment the track shoe magnet current is extinguished and the pressure of the brake-shoes upon the wheels is instantly relaxed and rotation of the wheels is resumed.

As is well known, when the motion of a car is being rapidly retarded, considerable of the weight normally carried by the rear wheels of the truck is transferred to the forward wheels, and here again the stop above referred to is utilized, constituting as it does a fixed fulcrum for the truck lever, giving a brake-shoe pressure to the forward wheels proportionately greater than that acting upon the rear wheels. The brake-controlling device may be incorporated in the running controller or may be a separate device placed by its side and operatively interlocked with it, so that neither can, through carelessness, be caused to interfere with the operation of the other.

HIGHER TRAIN PIPE PRESSURE FOR PASSENGER SERVICE.

By J. P. Kelly.

Without the use of pressure-reducing valves 90 lbs. train pipe pressure has been tried, and with success. On one road where the train pipe pressure was increased to 90 lbs. on one passenger engine, without any change whatever in the equipment, the success had from its use was so satisfactory that the pressure on all the other passenger engines on this road was increased from 70 to 90 lbs.; and this has been the practice on this road now for over a year and a half, and no trouble whatever has been had with slid wheels. In a great many cases we yet have light cars and light engines, the foundation brake gear of which would scarcely stand, with safety, any higher pressure than 90 lbs.; and wherever we have such brake gear it would not be good policy to increase the pressure beyond 90 lbs.

Modern passenger equipment has the foundation brake sufficiently strong throughout to withstand the strains and shocks that may be thrown upon it from a train pipe pressure of 110 lbs.; and when using 110 lbs. pressure, which we ought to do whenever conditions are suitable for it, we have to consider methods of regulating brake cylinder pressure for service and for emergency applications in order to obtain the desired results from this still higher pressure. While I believe that the up-to-date engineer is capable of using 110 lbs. train pipe pressure satisfactorily, yet, on account of the varying conditions of rail and places in which service applications have to be made, which conduce to wheel sliding, and on account of these applications being so numerous, it is probably better to have an automatic pressure-reducing device of a reliable character attached to the brake cylinder to relieve it of over-pressure at speeds below 20 m.p.h. But, admitting that there is a desirability for the reducing valves, I still believe that without the uniformity of braking force recommended to be had throughout the train, the reducing valves applied will not prevent wheel sliding to the extent which at first sight it might seem that they ought to prevent it.

As to the service application, air-brake men have carefully gone over the best methods of making them during the discussions of the last eight or 10 years; and it is now generally believed among them that what is known as the two-application method, where it can be used, is the best. This method is recommended in order to utilize a high pressure while the speed of the train is high, and to relieve the cylinder of that high pressure when the speed reduces to that point where wheel sliding might be expected or looked for, then the second application, with lighter cylinder pressure, to bring the train to a full stop without shock or recoil. With 90 and with 110 lbs. train pipe pressure, the good results looked for from the two application method in service applications will be realized in a much larger degree than they will while we are using the present standard of 70 lbs., and this fact alone is a good reason for increasing our present standard train pipe pressure.

During the past year a most practical and thorough test of high pressure brakes was conducted on the Central Railroad of New Jersey, and from the results there obtained it would seem that in an emergency application from 110 lbs. train pipe pressure there should be no blowing down whatever of brake cylinder pressure. The

following tables show the time consumed in making these stops, and the terminal brake-cylinder pressures at the moment the train stopped. These will probably prove quite interesting and, no doubt, will add something to the information we already have concerning the pressure it is possible to retain in the brake-cylinders without sliding the wheels, when the train is properly and efficiently braked throughout, and normal rail conditions prevail.

Full Service Application.

Speed in M. P. H.	Stop in feet.	Time of stop.	B. C. Press. Max.	Min.
34.35	402′ 3″	12.42″	79.2	78.1
33.63	430′ 5″	13.07″	77.9	77.4
32.78	355′ 3″	11.21″	78.6	78.

Emergency Application.

Speed in M. P. H.	Stop in feet.	Time of stop.	B. C. Press. Max.	Min.
51.28	656′ 9″	15.62″	85.3	77.5
51.13	613′ 3″	14.72″	85.6	78.2
50.84	631′ 10″	14.88″	85.6	78.
Speed in M. H. P.	Stop in feet.	Time of stop.	B. C. Press. Max.	Min.
68.96	1505′ 8″	27.03″	85.6	78.2
70.03	1595′ 7″	28.05″	85.2	70.7
70.86	1572′ 9″	27.63″	85.6	71.5

It is probably well known that the automatic pressure reducing valves do not reduce brake-cylinder pressure in the same proportion as the speed reduces, except for the speed for which they are adjusted; but that they blow down pressure according to a certain fixed rate and within a certain time limit. It follows, therefore, that if an emergency application of the brake be made at a speed of 40 m.p.h., and the reducing valve is adjusted for 70 m.p.h., the train will stop with a very high cylinder pressure, because the valves will not have time to blow down to the point at which they are adjusted before the train stops. This being true, we may ask this question: If this train carrying 110 lbs. train pipe pressure can be stopped in an emergency application from a speed of 40 m.p.h., without injurious wheel sliding, with the very high brake cylinder pressure had at the moment of stopping, why cannot the same thing be done from speeds of 60, 70, 80 and 90 m.p.h.?

Referring to the tables herewith, the full service applications were made from speeds of about 34 m.p.h. The time consumed in stopping was, on an average, about 12 seconds, and the maximum brake cylinder pressure obtained, on an average, 78 lbs., and that pressure was had in the brake-cylinder at the moment the train stopped, yet no wheel sliding resulted. This being a fact, naturally one would ask, "Why is it that with the higher terminal pressures no wheel sliding resulted?" This is largely accounted for by the fact that the engine and tender were braking up just as high, or nearly so, as were the cars, and consequently the cars did not have to assist in holding the engine; therefore, each vehicle in the train, doing its own share of the braking, when one was ready to stop they were all ready to stop, and no wheel sliding of consequence could possibly occur. With the engine equipped with a very poor driver brake and a very poor tender brake, the work of stopping the engine must be done by the wheels under the cars; and if such had been the case, the pulling force exerted by the locomotive, after the speed had reduced considerably, might be sufficient to drag the train along for several feet after the wheels on the cars had begun to slide.

In the table showing the emergency application from a speed of approximately 50 m.p.h. it will be seen that the time consumed in stopping was a little over 15 seconds, and the maximum brake cylinder pressure a little over 85 lbs.; yet the terminal pressure—the minimum pressure in the brake cylinder—at the instant the train was stopped, was 78 lbs. In this emergency application from 50 m.p.h. the train came to a standstill without any wheel sliding, and in the very short distance of 631 ft. In the second table of emergency applications, from a speed of 70.03 m.p.h., the train was brought to a stop in about 1,595 ft., a little more than 2½ times the distance in which it was stopped from a speed of 50 m.p.h., and in approximately 28 seconds; and, while the maximum cylinder pressure in the stop at 70 m.p.h. is no greater than it was at 50 m.p.h., the terminal pressures shown are approximately 8 lbs. less. We learn from this that the greater length of time required to stop the train from 70 m.p.h. allowed the brake cylinder pressure to blow down to a lower point than it did from 50 m.p.h.

In order to bring out more clearly what I believe to be the effect of this blowing down of pressure in the emergency application, and as an argument against doing so, I am presenting herewith a diagram, Fig. 1, showing the curves made by emergency applications with a six-car train from speeds of 50, 60 and 70 m.p.h. We will consider first the emergency application made from a speed of 50.84 m.p.h., shown in curve No. 1. In this stop the maximum cylinder pressure averaged 85.81 lbs., and at the stop, 15 seconds after the application of the brake, the cylinder pressure was yet 78 lbs. The next emergency application, shown in curve No. 2, in which the speed is 58.82 m.p.h., the maximum brake cylinder pressure attained was 85.5 lbs., about the same as before, while at the stop, 20 seconds after, the terminal cylinder pressure was 75.4 lbs. Thus between the time of maximum equalization of pressures and the time of stopping the train the pressure had reduced approximately 10 lbs. Our next stop, shown in curve No. 3, is from a speed of 70.86 m.p.h.; the maximum brake cylinder pressure attained was 85.6 lbs., and it reduced during the 26 seconds required to stop to 73.5 lbs.—about 12 lbs. reduced during the time the train was coming to a standstill.

A horizontal line is drawn through all three curves that indicates the 45-mile speed. An ordinate is dropped from this line to the base, and then the distance between this ordinate and the point where the train stopped in each case is taken. An ordinate dropped from the 45-mile line on the 50-mile per hour curve, shows the distance run before coming to a stop to be 450 ft. Next, in the stop that was made from 58.82 m.p.h. the same thing has been done and it has been found that the distance run between the ordinate and the point of stopping is 510 ft. Then by dropping an ordinate from the 45-mile line on the 70-mile curve, the distance between this ordinate and the point of stopping is found to be 545 ft. From this it appears, taking the 50 m.p.h. speed as a base, that the other stops of 60 and 70 m.p.h. were made longer, after the speed in each had reduced to 45 m.p.h., on account of the action of the reducing valves in blowing down the brake cylinder pressure.

From what these curves show it is evident that in an actual emergency it would be much better, especially from the higher speeds of 60 and 70 m.p.h., to prevent the cylinder pressure from blowing down at all, and when the speed had reduced to 15 m.p.h., have the engineer release and re-apply the brakes to bring the train to a standstill, if there yet remained sufficient room in which to do so.

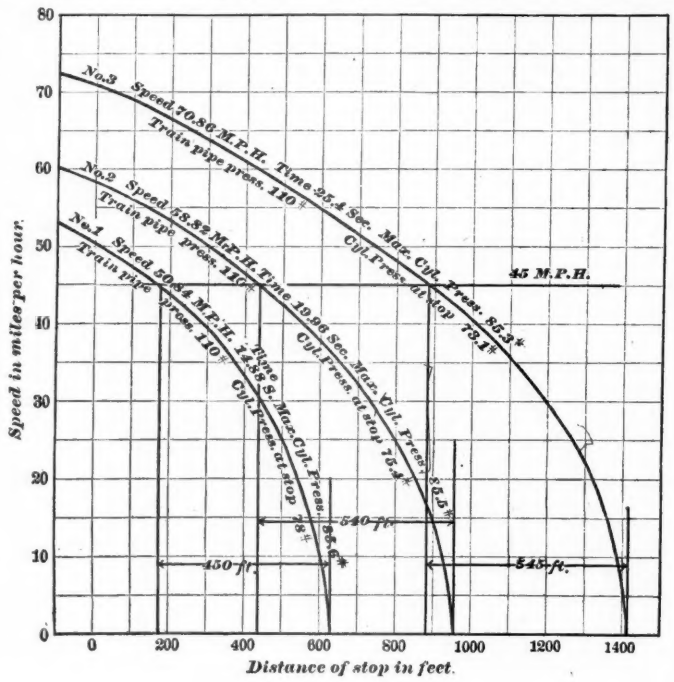


Fig. 1.

The destructiveness of a blow or of colliding bodies varies proportionally as the square of the velocity with which they strike; and, consequently, when occasion requires that the emergency application be used, it would seem the proper thing to do would be to reduce the speed of the train as rapidly as possible; or in other words to set up as high a rate of retardation as we could possibly and safely set up on the instant, and maintain that for as long a period of time as possible, so that, when the blow did come, the destructiveness would be reduced as much as possible.

Looking at this matter from another point of view, emergencies are things that depend largely upon other things; they are not absolute quantities, but they are variable. For instance, if we are carrying a pressure of 110 lbs. in the train pipe, and in the auxiliary reservoirs, we can stop the train from a speed of 35 m.p.h. in a little over 400 ft., with a service application; if we were carrying but 70 lbs., it would require a much greater distance in which to stop the train from this same speed, with a service application; therefore, with 110 lbs. train pipe pressure, any occasion which would require that the train be stopped within 400 ft. would require only a service application from this pressure to do it, whereas, if the train pipe pressure was only 70 lbs., to prevent collision or accident, the emergency application would be required; and even then it would be doubtful if the train could be stopped from that speed, with the lower train pipe pressure, in that distance.

Higher train pipe pressure may be regarded by air-brake men much in the same light as a powerful navy is regarded by a nation; the larger the navy and the greater the power the less the likelihood of war; and so it is with higher train pipe pressure; the higher it is and the better the stopping facilities against emergency the less the liability of occasion for using the emergency.

When we come to consider thoughtfully the time required to stop a train from 70 m.p.h., and from higher speeds, we can readily see that the likelihood of emergency arising that can be seen far enough away to provide sufficient room in which to stop the train without collision, is extremely unlikely; therefore, it is likely that all emergencies that arise, requiring the emergency application, on high speed trains, will occur in less distance than is hardly possible to stop in, even with the high train pipe pressure of 110 lbs.; for this reason it would be much better practice, when making an emergency application from this high pressure and high speed, to allow no blowing down in brake cylinder pressure whatever, and, if it should happen that sufficient distance is allowed in which to bring the train to a stop, to depend upon the engineer to work the two-application method to prevent damage to the wheels. Results favor the method here recommended of manipulating the brakes in emergencies, and this method, if carefully investigated, will be found of sufficient value to outweigh, by far, the only consideration for blowing down the brake cylinder pressure, namely, that of the prevention of wheel sliding.

There is an opportunity in emergency applications to use sand to great advantage, if there is time enough and room enough to get it started. If sand can be properly used, then the likelihood of wheel sliding is entirely removed, and the recommendation to prevent blowing down of brake cylinder pressure gains still further weight.

There are instances where it has been necessary to handle cars that were not equipped with an automatic pressure reducing valve, in a high-speed train, and those cars were placed in the high-speed train, without screwing a safety valve into their brake cylinders or making any provision whatever against any damage that might result to the wheels through over-pressure, should an emergency application be made; and I infer from the fact that the practice has not been attended by any annoying results, the high pressure must have worked all right upon it, although as one can readily see, without a safety valve in the brake cylinder of cars so placed the chances for wheel sliding on them were considerably increased. The likelihood of wheel sliding, when a condition of this kind obtains would be considerably reduced if all the other reducing valves on the train were cut out, and thus a uniformity of braking force, both in service and in emergency applications, be established throughout the whole train.

HANDLING PASSENGER TRAINS WITH BACK-UP HOSE.

A committee composed of Messrs. L. M. Carlton, G. R. Parker and J. W. Libby made the following recommendations:

1. No passenger trains should be allowed to back very far without a suitable back-up hose, and two trainmen, of one or two years' experience, should be on the rear platform.

2. All back-up hose should have a ¾-in. minimum opening and a warning whistle.

3. The whistle and brake should be operated with the same movement of the cock handle.

4. The train hose should be blown out before attaching back-up hose.

5. A terminal or road test of brakes should be made from the locomotive, and afterwards, a test with the back-up hose, using the standard code of signals of the road in question.

6. A running test should be made, the initial application being about 200 ft., or about three coach lengths from the start, the engineman to stop if a slow down is not felt within this distance.

7. The brake valve handle should be carried in running position, except following a dead stop, or slow down, and signal given to continue backing. Following either, the engineman should use the full release, temporarily, as in making a regular brake release to keep from sliding wheels with brakes stuck. The engineman should apply brakes when an emergency arises and is not noticed by rear man.

8. Trainmen should understand that to operate the brakes from the back-up hose, with the handle of the brake valve in running position, the valve should be opened gradually; also that the opening should be gradually increased until the valve is either wide open, the train slowed down as much as is desired, or has stopped. It must not be opened and closed. In case they have applied the brakes too hard, closing the back-up hose will allow the brakes to release and recharge. The rapidity by which the valve should be opened will depend on the speed and length of the train and the distance there is to stop in. In case of emergency, it should be opened wide instantly.

9. When a train is to be finally coupled to other cars, or rest against a bumping post, it should be stopped not over 15 ft. from the same, and then slowly moved toward its objective point.

BRAKE-BEAMS AND FOUNDATION BRAKE GEAR.

By T. A. Hedendahl.

The continually increasing numbers of broken and distorted brake-beams in evidence in the repair shop and scrap heap, lead to but one conclusion, namely, that the average brake-beam designed to meet the M. C. B. standard test of 7,500 lbs. load, is no longer adequate for the modern heavy capacity freight car, especially on heavy

grades, and that the line of pull is too frequently diverted from that for which the beams were designed.

The fact that not only has the light weight of freight cars increased to some extent, but also that the percentage of load-carrying capacity to the light weight is greatly increased in cars of modern construction, justifies the belief that all brake-beams should be capable of enduring the M. C. B. test of 15,000 lbs. for all cars of 80,000 lbs. capacity and over. The matter of maximum strains to which brake-beams on freight cars are subject has been given considerable attention, and have based their calculations of maximum strains on 70 per cent. braking power obtained from 60 lbs. brake cylinder pressure. While it is a fact that some roads use 80 per cent. and, in a few cases, 90 per cent. braking power, based on 60 lbs. brake cylinder pressure and carry from 90 to 110 lbs. train line pressure on the heavy grades, thereby increasing the braking power about 50 per cent. with the air-brake alone, then it is also a well known fact that in many cases when loaded cars are set out, especially on grades, the car is frequently stopped with the air-brake applied at full force, and then, without releasing the air, the hand-brake is applied at no mean tension with a club. For these reasons we doubt seriously that any freight car escapes having the brake applied fully 100 per cent. stronger than that for which the brake was originally calculated by the usual method.

The more recent departures from earlier methods in the design and construction of freight cars has frequently required that other than M. C. B. standard types of foundation brakes be employed, and in this some radically varied types are used; hence it is hardly possible to make recommendations as to complete forms, but rather to confine ourselves to certain desirable details. Investigation has developed that the M. C. B. standard turned pins are used quite generally on cars of recent construction, but the holes in levers and lever jaws are frequently found to have been drilled with flat drills, consequently are more or less out of true (not round), and are generally larger than standard and, what is still more deplorable, these holes are sometimes found to be punched. All pin holes should be formed to standard size by the use of twist drills, or the equivalent.

Cylinder and floating levers should be proportioned so that the distance from piston push rod to cylinder lever tie rod is not less than 12 in., and still better results follow if this dimension is 14 in. When extension of cylinder lever for attachment with hand brake rod is used this should likewise be limited, preferably not to exceed 3 to 4 in. from center of piston push rod to center of hand brake rod, obviously to give as nearly as possible an equal distribution of braking power on both trucks when hand brakes are used. If additional leverage is required to hand-brake, it can be accomplished more satisfactorily by the introduction of an "increaser" between cylinder lever and hand-brake chain and attachment made direct to push rod by means of an extension of jaw and an additional hole in same. It is obvious that air and hand-brakes should always operate in unison on both passenger and freight cars; if one resists the other there are times when both will be found inefficient. Brake-beam levers (live and dead) should be of the lowest proportion consistent, preferably not to exceed a three to one value, as by this means the top rods and attachments are required to travel a proportionately shorter distance in absorbing brake-shoe wear and clearance, thereby facilitating the brake-shoes to clear the wheels after brake release, and likewise diminish tendency for live and cylinder levers assuming acute angles to the line of force during brake application.

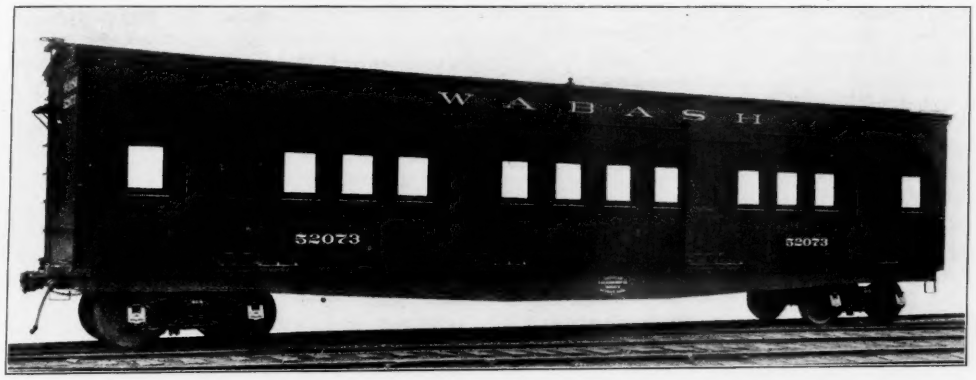
Dead lever anchors or check rods should be suspended as near a horizontal position as possible in order to eliminate the torsional strain on brake-beam and lever fulcrums, when such check rods are at an angle to the line of pull, an altogether too common condition on freight cars.

When brake cylinders of larger than 8-in. diameter are used on freight cars, they should be of the detached type, having lever jaw on pressure head, to which the floating cylinder lever should be attached, thereby reciprocating piston power and eliminating this strain from cylinder support. However, if floating lever cannot be so connected with cylinder head, better results are obtained from the use of connected auxiliary and brake cylinder type of brake. Brake cylinders and auxiliary reservoirs should be securely bolted to metal plates, and the latter bolted or riveted to the underframing of cars; the belts fastening brake cylinder to metal plate should be provided with cotter pins or double nuts, or both. By the use of wood blocks for attaching these parts to car framing, loose attachments are inevitably the result, owing to shrinkage of the wood.

Cars for the Wabash Shuttle Trains at St. Louis.

The Wabash inaugurated its shuttle train service between the Union Station and the World's Fair Grounds, St. Louis, on Saturday, April 30, the day of the opening of the fair. The facilities for handling passengers at the Fair Grounds and the automatic block signals and interlocking plants installed to facilitate train movements along the route were described in the *Railroad Gazette* Jan. 29, p. 78. Trains leave the Union Station every 15 minutes beginning at 8 a.m., and make the trip to the grounds, five miles, in about 15 minutes.

The American Car & Foundry Company built 150 cars for this service at its Detroit works. Because of the temporary nature of the service the cars were designed so that they may readily be changed into standard furniture cars when the fair is over. The accompanying illustration shows the exterior appearance of one of the cars. They are 50 ft. long inside, 8 ft. 9 in. wide and 8 ft. 9¾ in. high, with steel underframes. Below the floor line they are of standard freight car construction. The trucks are of 80,000 lbs. capacity with cast-steel bolsters and channel spring planks. Twin spring draft gear, Westinghouse freight brakes and Gould couplers are applied. The underframe consists of four built-up, fish-belly sills, built up bolsters and channel end sills. The center sills have an I section, made up with a web plate and four angles, and the side sills are of channel section with a web plate and two angles riveted on the inside face. The center sills are 22 in. deep at the center and the side sills are 20 in. deep. The body framing of the car has, of course, been modified from standard freight body construction to allow for the windows and doors. These have been so spaced along the sides that the permanent posts of the body framing form a part of the temporary framing and will not be removed when the cars are changed over for freight service. The braces and brace rods have been omitted in the side framing. The end framing and double board roof are Wabash standard for freight cars.



Wabash Shuttle Car for World's Fair Service.

The sides are cut for four 22-in. door openings and 12 windows, 17½ in. x 21¼ in. The ends of the cars are sheathed all the way up but the sides are sheathed only up to the window belt rail, 36 in. from the floor. The seats are made of oak slats and are ranged along both sides with an aisle 35 in. wide down the center. They are 35 in. long and 14½ in. wide and are grouped singly or back to back in the following order: Beginning at one end, there is a seat running clear across the car holding six persons; then three sets of double seats, two sets of single seats, two sets of double seats, two sets of single seats, three sets of double seats, and the end seat across the car. This arrangement gives a total seating capacity of 92 passengers. Hand rails supported on brackets from the carlines 7 ft. above the floor and having straps hanging from them permit other passengers to stand in the aisle without being thrown about. The cars are lighted with three single-burner oil lamps mounted under the roof. They are painted olive green on the outside and a slate gray on the inside. The interior appearance is relieved by the advertisements which are fastened on the walls in racks and on the posts and end sheathing. A bell cord carried on hangers through the cars provides for communication from the rear end to the engine.

The doors run on rails outside the car and those on one side are opened simultaneously by a rod and lever at one end of the car. They are closed independently by the guards on the platforms in order to prevent accidents by passengers getting hands or clothes caught by the closing door. The train platforms at each end of the line are on a level with the car floor and come out to within two or three inches of the side of the car. Trains are made up of two or more cars according to the crowd and are hauled by light eight-wheel engines of the type used on the Wabash for hauling local passenger and light freight trains. We are indebted to W. J. McBride, Vice-President and General Manager of the American Car & Foundry Company, for the illustration and details of the description.

The Shantung Railroad.

Mr. Franz Woas, of Shanghai, in the Journal of the German Railroad Union, gives an account of the new railroad in the Chinese province of Shantung, which was built by the "German-Asiatic Bank," a corporation in which most of the principal German banks took stock, and which was organized not only to build railroads, but to develop coal mines and other industrial enterprises in this province, which is under German protection. Construction was begun in 1898, interrupted for about a year in consequence of the Boxer insurrection, but completed more than four months before the expiration of the time named in the contract. The length of the main line from the harbor of Tsingtau westward to Tsinau-fu, the chief city of the province, on the Hoang-ho, is 247 miles, and there are 30 miles in two branches to coal mines; the cost when all is completed will not exceed the estimate of 54,000,000 marks ($12,852,000), which is $46,400 per mile. The chief difficulties in the way of construction were the lack of means of transportation, the distance from the source of materials in Germany, and the disposition of the adjacent population, to some extent hostile, and not readily available in the work of construction, also in the number and varying stages of water of the streams crossed. Some of these streams rose as much as 25 ft. within a very short time; the mighty Hoang-ho itself about 16 ft. It was necessary to build 18 iron bridges, of an aggregate length of 23,694 ft., besides numerous masonry culverts. The longest, over the Tse-ho, is 1,449 ft. long. The foundations of two piers in the Wei-ho gave way before the bridge was completed.

The cost of the land for right-of-way was unexpectedly low, averaging about $108 per acre. The negotiations for it were conducted by Chinese officials and caused little difficulty. These officials also arranged for the removal of graves from the right of way at a cost of only about $1.20 per grave. The rails, laid on steel cross-ties, weigh 60 lbs. per yard. The ties weigh 110 lbs. each. They are 8 ft. 10 in. long. The track was laid by Chinese contractors for about $72 per mile. The earthwork was also done by contract for the most part at a very low price. Mason work (without materials) was done for about 80 cents per cubic yard; with materials, $2.10. The iron bridges were thought costly. The German iron works delivered them free on board in Antwerp for 325 marks per kilometric ton; 33 marks more was paid for freight, and 170 marks for erection, making 528 marks when in place = $115 per ton of 2,000 lbs.

The stations are simple, and there is no provision for heating the waiting rooms, and this in a climate as cold as New York's. The railroad has 24 locomotives, 14 of which weigh 100 tons each. There are 351 coal cars, and but 235 other freight cars; 15 second-class, 30 third-class and 50 fourth-class passenger cars, of the German style. They are fitted for heating by steam from the locomotive, but they have not been heated because there was no steam to spare. There are no seats in the fourth-class cars. The Chinese squat and do not sit.

The coal mines worked at present raise about 300 tons per day. Other freight so far has not amounted to much, though the railroad passes through a very populous and productive country. The passenger traffic has been more satisfactory, but it is nearly all fourth-class. So far there are two through trains daily, making about 25 miles an hour. The trainmen are all Chinese and are very satisfactory. There are 8 local trains.

Railway Signal Association.

The May meeting of this Association was held in New York City on Tuesday afternoon of this week. Mr. J. C. Mock, President of the Association, occupied the chair and about 40 members were present. Eleven new members were elected.

The meeting spent the first two hours of the session in discussing definitions reported by the Committee on Definitions and Nomenclature. Most of the definitions set forth in the report were in the nature of suggestions merely, and nearly every item was referred back to the committee for revision. The committee has not yet had a full meeting for detailed consideration of the work before it. At the close of the discussion a resolution was passed instructing the committee to consider those definitions of signaling terms which have been adopted by the American Railway Association and to report on them, suggesting any criticism or amplification of those definitions which the committee may deem it desirable to lay before the Railway Signal Association.

The meeting discussed, in a desultory way, the question, propounded by Mr. Mock, whether it is practicable to give true indications by distant signals in a system of automatic block signals on single track where the home signals are staggered; but no conclusion was reached. After listening to a paper by Mr. J. B. Struble, of the Union Switch & Signal Company, on the Alternating-Current Track-Circuit Automatic Signals on North Shore Railway of California, the association adjourned.

The next meeting of the Association will be held in Chicago on September 13. It is expected that the annual meeting will be held at St. Louis, October 11, and that the headquarters of the Association at that time will be the Inside Inn, which is inside the World's Fair grounds, close to the southeast entrance.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

At time of writing the freight steamer lines on the Great Lakes are thoroughly tied up by the inability of the owners to make a working agreement with the masters and pilots. The situation, in brief, is that the masters and pilots within the last few weeks have strengthened and perfected their organization until they now control what might be called the license market. It is unlawful for the boats to be in charge of a master or pilot who has not taken out a government license, and the association seems to have cornered this field of industry. The masters and pilots ask for an increase in pay, which the owners are quite unwilling to grant. They also ask that the rating of the boats—in accordance with which the salaries are determined—shall be done by themselves; that they shall employ the crews, and that they shall not be subject to discharge except in each instance after arbitration. They ask that the prevailing rate of wages of from $1,800 to $2,100 for the season for masters on first-class boats be increased to a maximum of $2,250. The present rate of pay is considerably higher than that prevailing on trans-Atlantic steamers, except the largest, and it is perhaps a safe statement that two-thirds of the captains of transatlantic vessels would be glad to receive for 12 months what the Lake captains receive for six or seven. In view of the dangers and responsibilities of Lake navigation, however, that point, may, perhaps, be disregarded. The crucial matter is that the owners are entirely unwilling to furnish the capital, brains, and energy required in the establishment and management of a steamship line and then be deprived of voice in its management—for the powers which the masters ask of rating the vessels, of employing help, and of themselves being not subject to peremptory discharge, are the powers which are inherent to ownership. So negotiations have been temporarily broken off by the announcement by the steamer owners that they can no longer accept railroad freight or make freight contracts; and the steamers are to remain idle until the masters and pilots gain a clearer idea of the inherent differences between owning a vessel and being captain of it.

The question which confronted the Atchison management with regard to the threatened strike of machinists and machinist apprentices had many points of similarity to the lack of harmony between the vessel owners and the captains and pilots. An abstract is given in another column of some of the rules for shop government insisted on by the machinists. In commenting on proposed rule No. 20, with regard to the posting of the rules and regulations in conspicuous places—an extremely minor demand by the union so far as any money cost attaches—the officers of the Atchison exhibit a little excusable irritation in saying that the company will establish all the rules that may be necessary for the government of its shops and employees. The third vice-president, Mr. Kendrick, closes his brief with the affirmation that it is the natural, inalienable prerogative of an employer to judge of the capabilities of his men and also to judge of their worth, according to the standard of wages which may obtain from time to time. But, after all, the respective authority of labor and of capital in the formulating of rules and of schedules rests on a principle of fundamental simplicity. It is not a question which can be settled by law or by conference, and the broad general principle of it is not amenable to strikes. The employer is so called because he employs, and if he cannot fill his contracts, he must simply stop employing. When the Atchison closes its shops and when the Lake vessel owners tie up their ships, the striking associations are left without ground to stand on, for it is far easier for the owner of a vessel or of a shop to find new agents to work for him than it is for striking agents to so arrange it that the shop or the vessel in which they are employed shall be controlled by another owner. The best of the labor organizations have done much for their members in adding dignity and the influence which comes from force of numbers to their efforts to better the conditions under which employees work, and to gain increases in pay. But in assuming the prerogatives of ownership they are attempting not only what is unjust, but what, in the long run, must be impossible, for a shop or a vessel cannot serve two masters, and even the sovereign state is, by the Constitution, denied the power of seizing property without due process of law.

What is a Superintendent's Understudy?

An esteemed correspondent has called us to task for recommending that division superintendents be allowed or required to have understudies, and wants to know how a man acting in that capacity can be made to accomplish anything really useful. As the young men who have been understudies of our correspondent himself have turned out to be efficient executive officers, we conclude that the difference between his view and ours is one of definitions chiefly, and that we had better explain our meaning more fully. If we shall still be unable to agree with him, we must call his attention to the entirely modest and hesitating way in which our suggestion was offered; we have no intention of stuffing the idea down any superintendent's throat; we were simply calling attention to the fact that some managers who had tried the idea had not been instantly choked to death.

An understudy is different from an assistant superintendent chiefly in not having constant responsibility, but he is not inactive or useless; he is kept at work on all sorts of tasks. An understudy in a theater is not an idle person, with nothing to do but criticize the other players; she has a part. Instead of doing less work than the other members of the company, she does more; she fills her own part and masters that of the star actress besides. The need of an understudy in a superintendent's office is due chiefly to the universal custom of giving the assistant superintendent (or the trainmaster, or whoever is next to the superintendent) all the work that he can possibly do. This second-officer ought to have time to study his chief and his chief's work; but he does not, and so an understudy is needed. When a superintendent dies or resigns, it takes a new man a year to get fitted into his place; if an understudy be at hand, the wastes and losses due to this year of partial ignorance are largely prevented. If our critic wishes to call the understudy by some other name, we shall not quarrel with him. The essential thing is to have a man whose activities are in the superintendent's line and who has time to do some outside and original thinking. A chief difference between the ideal superintendent and his assistant or trainmaster is that the latter is more tied to routine duties, while the superintendent acts and thinks in all fields and goes where he pleases. If a division is small enough, the same person can be half assistant superintendent and half understudy. The trouble is that too many of us try to do this on large divisions; to get along with two halves when the need is for two wholes. If a superintendent in a given place is to be promoted out of it in two years, a reasonable arrangement would be to have his intended successor work one year under him as assistant superintendent and one year as understudy.

The principal difficulty in working this out lies in the item of cost. When a $3,600 superintendent leaves, the customary thing is to give the place to a $3,200 superintendent from another division; the manager who gives it to a $2,400 understudy who is already on this division upsets the prevailing notions about rights of seniority and endangers his own popularity. But if our premises are sound; if superintendents have more duties than they can attend to, and if a green superintendent is unprofitable because his greenness causes losses, then $6,000 may be a justifiable expenditure for salaries where $3,600 has been deemed adequate. Once the expenditure has been shown to be warranted, the changing of men from one division to another is made comparatively easy, for each place is constantly manned by two good men, and a change of one of them affects only half of the force.

Our correspondent's objection to the understudy idea appears to be based on certain bad examples that he has seen; examples so unsatisfactory that he concludes that all are irremediably bad. He seems to have found these functionaries either useless by reason of their ignorance, or worse than useless by reason of their pedantic meddlesomeness. But, surely, we cannot condemn a principle because somebody has blundered in applying it. Our correspondent appears to agree with the superintendent who spoke in our issue of February 19, page 126, that the specialist—that is, the understudy—is a theorist who has very little respect for the practical and who, when he is wrong, cannot be convinced of it. But such a man is not fit for any important place in railroad management, or even for a position in the drafting room. What general manager has appointed that kind? Anybody connected with a superintendent's or a general manager's office necessarily has daily intercourse with "practical" men possessing both character and energy, and one conspicuously lacking in respect for these men and their doings is incapacitated from the outset. If, as is claimed, it is dangerous to oppose the specialist, because he is "near the head," that implies that the head himself cannot be opposed; that he is reluctant to listen to reason (from a subordinate) when he is wrong. But that is no reflection on the principle that we are advocating. We cannot give much help to the subordinate officer who is afflicted with that kind of a superior, but it may be said in passing that the work of restating and strengthening one's arguments so as to make them "go" with an obstinate superior is excellent exercise that is seldom wasted.

The understudy who is a "specialist," entrusted by the superintendent or manager with special jobs or roving commissions should first of all be sufficiently human to make friends—or at least friendly coworkers—of the subordinate officers with whom he comes in contact. The old notion that "executive ability"—of the kind that we expect in a snow-plow—is the one essential qualification for a man who is expected to become a superintendent, ought to be exploded by this time. But if the understudy combines executive ability with tact, his usefulness as a theorist is next in order. Evidently this point has received its full share of attention already, for more than one correspondent voices the complaint with which we are dealing. Can it be that no manager has found men for understudies who were both theoretical and practical? Why not take for the position some of your own young men who have already shown some respect for and sympathy with the practical? The most shallow and narrow of these specialists have, presumably, spent a portion of their time in real work; is there need of a general revision of our school practice; of a large increase in practice-study and a decrease in the time spent exclusively in acquiring "book-learning?"

Whatever difficulties we may have in finding suitable helpers for superintendents, or qualified candidates to fill the superintendent's shoes at a later date, or however we may dispute as to what name to call them by, the duty remains to continue the quest, for the need is acknowledged; our defects in discipline are largely due to a lack of competent officers who are "on to their jobs."

Termination of the Hungarian Strike.

Mail advices show that the strike on the Hungarian State Railroads, which caused an almost total suspension of traffic April 20 and a less complete one for two or three days thereafter, was the result of dissatisfaction with a revised scale of wages, privileges, etc., a bill for which had been introduced into the Hungarian Parliament by the Minister of Commerce, who has charge of the State Railroads. As we have said, the employees had long been agitating for an improvement in their condition, partly by higher wages, and partly by more rapid advancement and other privileges. The government had agreed that something ought to be done for them; but last year the condition of parliamentary business and of politics was such that a bill could not be got through. A short time before the strike the Minister brought forward a bill making the changes in salaries, etc., which he thought practical and expedient, and which would add considerably to the expenditures for the service. What

it granted, however, was so far short of what the men had demanded that they seem to have been universally dissatisfied and, indeed, indignant. Laborers were to receive an advance of $20 per year; the lower grades of permanent employees, $16, $32 and $40; higher classes, $40, $60 and $80, but there was no increase for the highest class.

When the contents of the bill were known, meetings of employees were held at all railroad centers, and resolutions passed expressing their dissatisfaction with the proposed scale of wages; and delegations were sent to the Minister of Commerce and to the Prime Minister, and at last a strike was threatened and a collection ordered to indemnify any possible victims of the movement. So long as the movement only urged better rates of pay, the government paid no attention to it. When a strike was threatened, the Minister issued a circular reminding the men that their contracts, which they had confirmed with an oath, bound them to perform their service. and he forbade any collection for those who should refuse. Thereupon a general meeting of State Railroad employees from all parts of Hungary was called to meet in Budapest April 20. On some divisions the applications for leave to attend this meeting were so numerous that if all had been granted the roads could not have been worked. The Ministry ordered that no leaves and no free passes be granted. Thereupon in some cases the men seized cars and locomotives, made up trains, and ran them to Budapest in defiance of authority—which was about equivalent to highway robbery. Parliament was then in session, and in it the Minister declared that his plan for the regulation of pay, etc., put the railroad men at least on an equality with the other civil servants of the government, and the Prime Minister defended the action of the city police in arresting many of the striking employees, who had formed a regular camp in the city. He said the movement was not a strike in the proper sense of the word. A workman who has entered into no engagements is free to dispose of his labor, and has full right to refuse work unless he is offered what he asks for it, and is to be condemned only when he interferes with the rights and freedom of others. No such question arose here. Men were refusing to do the work which they had contracted to do and sworn to do when they were appointed.

On the 20th a member of Parliament popular among the railroad men had an interview with the strike committee, which, however, refused to negotiate unless the men who had been arrested should be discharged; this was granted; whereupon the committee submitted five demands:

1, The approval of all the memoranda concerning wages, etc., which the men had presented; 2, the issue of service regulations, defining all rights and duties; 3, permission to establish a national union of railroad employees; 4, no one to be punished for his part in the strike; 5, all these demands to be established by law.

The government declared itself ready, 1, to grant a general amnesty; 2, to permit a national convention; 3, to permit the men to hold meetings in future to express their desires and their opinions concerning the proposed scale of pay; 4, assurance that the new bill should be pushed to vote as soon as the men should declare their position in regard to it; and the issue of service regulations. All this was on condition that the men resume work immediately.

Part of the strike committee were willing to accept these conditions, but the majority required the granting of all the demands of the strikers, especially those concerning wages. Some slight concessions were offered by the government, but these were followed by new demands by the strikers.

The Prime Minister reported to the Parliament on the 22d that there was little prospect of a settlement by negotiation; and that if the men did not return to work the next day, the government would proceed to engage new men and make new appointments to the permanent corps—which would mean the discharge of several thousands of men who held positions for life, with right to promotion, pensions, etc. The next day several battalions of the railroad regiment were ordered to operate the most important lines, the strikers' camp was broken up by the police and all the railroad men belonging to the army reserves—doubtless most of the employees—were called out and detailed to serve on the railroads under the officers of their regiments, to disobey whom would have serious consequences.

Hereupon the strike committee sent to the Minister of Commerce offering to modify their demands materially. "Too late," said he. The time for negotiations had passed, and the government would go on as it had begun. Until the roads were all running again, there would be no further talk with delegates; but he would be glad to have the strikers take their places again. Evidently they made for the same day all the principal passenger trains were a rush to secure them before strangers had taken them; for the same day all the principal passenger trains were running, and freight traffic was resumed on a moderate scale the next day.

Last week Tuesday in the United States Circuit Court at Boston Judge Lowell appointed receivers for one street railway line in Massachusetts and had before him for later decision applications for receiverships of two other street railways of that State. Such legal episodes falling together cannot fail to suggest that even the popularity of the trolley and its unlooked-for patronage have not been enough to prevent the same sort of undue and reckless construction which marked the building of steam roads before the panic of 1873, and, in fact, caused that financial convulsion. While Massachusetts receiverships for street railways may seem a bit strange in view of the success of the railroad commission of that State in keeping down capitalization, it must be remembered that the best commission in the world cannot prevent folly in railroad projects. It can compel every dollar of capital invested in a trolley from Noville to Nowhere—with a few farm houses between—to be paid in as cash, but cannot prevent the infatuated investor from sinking his dollars in the enterprise. Nevertheless there appears considerable paradox in the fact that Massachusetts, which has kept down street railway capitalization to $48,621 a mile, is appointing street railway receivers, while in Connecticut, out of some 35 original trolley lines only one has ever defaulted on its bonds notwithstanding a general capitalization—stocks, bonds and floating debt—of some $84,000 a mile. But it can be accounted for on other grounds than the perilous dictum that the children of financial evil are wiser in their generation than the children of light.

On the evening of April 26 a ferry boat from Manhattan to Brooklyn (New York) ran uncontrolled some distance, as it approached the Brooklyn landing, by reason of the sudden death of the engineer, from heart disease. The pilot, on finding that his stop signal was not obeyed, ran the boat into the flexible piling of the approach to the slip, but the boat and slip were both badly damaged and one passenger was injured. The newspapers at once took the occasion of this accident to discuss the desirability of having a second man in the engine room of ferry boats; and the officers of the principal ferry companies were asked about their practice. The presence of a second man in the pilot house of ferry boats in New York Harbor is required by law, but the manning of the engine room is not touched upon by the statute. On most of the larger ferry boats in the harbor there is an oiler, or an assistant engineer, close to the engineer, and the boats on which the engineer is alone are nearly, or quite, all old-style vessels. The Local Board of Government Steamboat Inspectors has requested all of the companies to have a second man regularly assigned to the engine room of their ferry steamers; and it is said that all will comply.

National of Mexico.

The company now in control of this much reorganized property was organized under the laws of the State of Utah, in February, 1902, for the purpose chiefly of taking over the properties of the Mexican National, which was undergoing readjustment. Two other small railroads, aggregating some 60 miles of line, were included

National of Mexico.

in the transfer. The plan provided for completing the change to standard gage of the entire International line from Laredo to the City of Mexico (802 miles), and also for the building of a standard gage cut-off which shortens the line between the City of Mexico and the northern frontier, and avoids heavy grades. At the same time an agreement was made with the government of Mexico by which the latter has now acquired a large amount of the several classes of the company's capital stock. The former government holding of second debenture stock of the Interoceanic, running from Acapulco to Vera Cruz, was sold to the National of Mexico, which, with Interoceanic stock already owned, gives the company control of the Interoceanic and incidentally makes the National the largest railroad system in Mexico. An executive concession was also procured, with the necessary legislative ratification, providing that for 20 years, from October 31, 1902, no right, privilege, or concession should be granted by the United States of Mexico to any person, or corporation, except the National Railroad of Mexico, to build or operate any railroad (except branch or local lines connecting only with the trunk lines of the National) in a zone extending along the northeasterly boundary of Mexico, bounded on the northeast by the Rio Grande and on the southwest by a line drawn 50 kilometers southwest of and parallel with that river, and lying between the Gulf of Mexico and the meridian running through a point on the Rio Grande, distant 100 kilometers northwest from Ciudad Porfirio Diaz, in the State of Coahuila, measured along the Rio Grande.

So the Mexican National, under its third official title since 1887, seems to be placed in a fair way to grow with the country and to profit by any subsequent prosperity in the northern part of Mexico. The earnings at present must still be disappointing to investors in the property, but there is an improvement this year. Like other Mexican roads, it may be said that the National has to do its buying and interest paying in gold, while it sells its commodity of transportation in silver at a fluctuating parity. The present value of the Mexican silver dollar, expressed in terms of gold, is about 42 cents.

Total gross earnings for 1903 were approximately $4,780,064 (gold), operating expenses were $3,216,978, and net earnings were $1,563,086. The net earnings were $233,657 greater than in 1902. Gross earnings per mile of road worked were $2,280 (gold) this year, as against $2,882 per mile last year. Operating expenses were $2,207 per mile as against $1,882, and net earnings per mile were $1,073 as against $1,000 last year.

During 1903 the change of gage from 3 ft. to 4 ft. 8½ in. has been completed on all that portion of the line which was designed to be changed, and the cut-off referred to above has also been completed. Neither of these improvements has as yet been in operation long enough so that its profits can be accurately estimated. The disproportionate increase in working expenses compared with the increase in gross earnings is chiefly accounted for by the increased cost of working the line with a large increase of traffic while this gage change was in process. The principal statistics of operation follow:

	1903.	1902.
Average mileage	1,452	1,350
Gross earnings (gold)	$4,780,064	$3,903,105
Operating expenses	3,216,978	2,548,709
Net earnings	1,563,086	*1,354,396

*Approximate.

NEW PUBLICATIONS.

Notes of a Railway Superintendent's Life. By G. P. Neele, late Superintendent of the line of the London & North Western. Notes and reminiscences of half a century's progress in railroad working and of a railroad superintendent's life, principally on the London & North Western Railway, with some supplementary memoranda as to the railroad journeys to and from Scotland made by her late Majesty, Queen Victoria. 544 pages, 6 x 9. Illustrated with 23 portraits. London: McCorquodale & Co., Ltd., Cardington street. 1904.

The title page of this historical autobiography describes fully the nature and scope of the book. Its tone is reminiscent throughout, and matters of local interest are treated with such abundant detail that the reader gains an intimate knowledge of the way things were done on the London & North Western, and, incidentally, on other English lines through a long series of years, beginning with 1847. The incidental biographies of the well-known English railroad men are interesting and colloquial in their character. Mr. Neele rightly says in his preface that a railroad service commencing in 1847 carries one back a long way towards association with those who were the actual pioneers of the British railroad system, from whom British managers learned their first lessons, by whose successes they have profited, by whose failures they have acquired knowledge, and on whose foundation it has been endeavored to raise a superstructure of so substantial a character that those who are to come will have no reason to be ashamed of their predecessors. It is pleasant, too, in these times of intensely practical and condensed narrative, to find an author who has plenty of time to talk about all the trivial little matters which really make life interesting. A very thorough insight into the development of English railroad practice and the ideas from which it originated can be gained by reading Mr. Neele's book.

TRADE CATALOGUES.

The Erie Railroad has issued the eighth annual edition of its pamphlet for fishermen. General Passenger Agent D. W. Cooke has found that the fish are going to bite this year much more freely than ever before, and therefore urges readers to secure a copy of his book at once, before the supply is exhausted. This is one of the best fishing manuals issued by a railroad. The text is as entertaining as the pictures of the scenery, which is saying a good deal. The chapter giving instructions about fishing in Lake Chautauqua is by a clergyman, as befits the locality. These entertaining parts of the book, about 40 pages, are separated from the dry portion, the directory. The directory is dry, however, only in the sense of being in small type and condensed. For its purpose it is exceptionally good. Every line appears to have been prepared with care. For example, under Lordville, N. Y.,

(153 miles from New York, round trip fare $6.60) ten localities are mentioned in this fashion:

*Equinunk Creek, Pa. (1 mile)—Trout. Start 2 miles above and fish to factory. There is also good fishing in two branches of this stream—South Brook and Crooked Creek. Open enough for fly-fishing. Stocked in April, 1900, with 5,000 brook trout fry, and in June, 1903, with 1,000 brook trout fingerlings.

The Stanley Electric Manufacturing Company, Pittsfield, Mass., issues Bulletin No. 139 describing S. K. C. high-voltage oil switches. These switches are so designed that the circuit is broken simultaneously at several points. For potentials above 6,600, the various contacts are arranged in the same horizontal plane, so that the disturbances resulting from the rupturing of the arc are distributed rather than concentrated. The contacts are located comparatively near the surface of the oil, so that the gases resulting from the explosion are readily dissipated. Each switch is tested at 120,000 volts, and in installing, the iron top and tanks are grounded, making it perfectly safe for the operator to handle the controling device. The switches are so designed that they may readily be taken apart for shipment. The bulletin contains a few line drawings and half-tones of the various kinds of oil switches.

The second number of *Something Pneumatic*, the monthly magazine of the Chicago Pneumatic Tool Company, contains articles on "Portable Compound Air Plants on English Railroads," "Compressed Air in the Lumber Yard," "A Novel Planing Mill," "Cutting Out Doorways With a Pneumatic Hammer," and a number of pneumatic devices, or parts of devices, including a new automatic oiling device, jam riveter and improved Chicago rock and plug drills.

The Safety Car Heating & Lighting Company, 160 Broadway, New York, has just issued a pamphlet of its various exhibits at the St. Louis exposition. Most of these exhibits are of the Pintsch Gas Lighting and Heating equipment and are shown in connection with the exhibits of the Pullman Co.'s train, the American Car & Foundry Co.'s train, the Empire State Express, the Hicks Car Works, the Illinois Central Railroad and the Continental Iron Works.

The Crosby Steam Gage & Valve Company, Boston, Mass., has issued a circular showing a recent design of high speed steam engine indicator. The Crosby reducing wheel is also shown. These indicators have helical springs which it is claimed are especially adapted to high speed work.

Some Straightway Gate Valves.

The illustrations show some typical examples of the straight-way gate valves of the Western Tube Company, Kewanee, Ill. In these valves the gates are parallel and the arrangement is such that they will not slide on the seats in closing and opening, thereby avoiding risk of injury. From the sectional view, Fig. 1, it will be seen that the discs, or gates, are hung on a sleeve, the lower end of which is formed to exert a wedging action on the gates after they have come in contact with the wedge-shaped boss at the bottom of the valve body. The action is such that the gates do not touch their seats until forced against them in the final act of closing. In opening, the reverse effect is obtained.

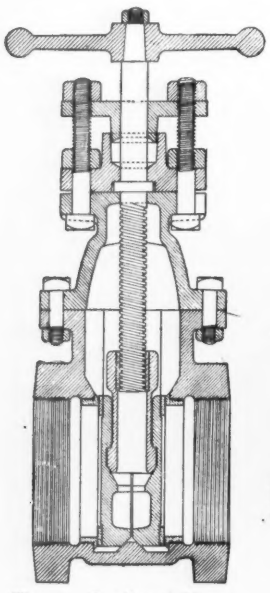


Fig. 1.—Sectional View.

Fig. 2.—Hub-End-Water Gate Valve.

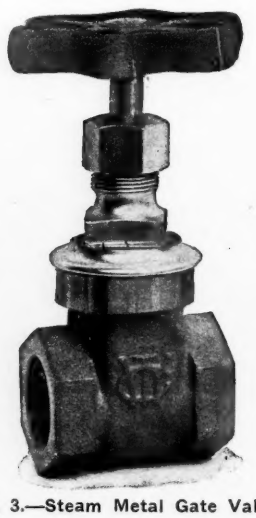


Fig. 3.—Steam Metal Gate Valve.

The design in Fig. 1 has an iron body, brass trimmings and stationary stem. It is claimed that the distribution of metal is such as to obtain the greatest possible strength. The gland and stuffing-box are bolted to the bonnet, which is provided with slots to enable easy adjustment. Fig. 2 is a hub-end water gate, suitable for 150 lbs. working pressure. It, also, has an iron body and brass trimmings. The valve in Fig. 3 is made of steam metal and has a compound-screw, half-rising stem. It is made flanged or screwed.

Hydraulically Forged and Rolled Steel Wheels.*

A description of the Schoen process of hydraulically solid forging and rolling steel car wheels was printed in the *Railroad Gazette*, June 19, 1903, and photographs of the rolling mill and of the forging press were shown at that time. The solid steel wheel was developed by Mr. Schoen to provide for the great increases in the weight of cars, for, during the changes from 60,000 lbs. to 80,000, 100,000 and 110,000 lbs. capacities, the substructure proper, represented by the wheels, was practically left untouched except for occasional additions in weight, while it was not possible to add weight or thickness at the root of the flange, the spot where it was most needed. Mr. Loss designed for Mr. Schoen a plant to remedy this by forging a wheel of solid steel, and in his paper before the Franklin Institute he discusses some of the economies of the steel wheel. An abstract of the paper follows:

In order to make a successful steel wheel the balance sheet must, first of all, be taken care of, and with this in view the price of such a wheel must be limited to a figure which shall bear a certain relation to the one of cast iron. In order to throw some light on the subject, the writer secured, a few years ago, some information from one of our leading railroads which will enable us to form an approximate opinion. It was found from two years' runs, covering 5,320 cast-iron wheels (33 in. diam. and all legitimately worn out), in passenger service, that the average life per wheel was 56,000 miles. One hundred steel-tired wheels of the same diameter, and used in the same class of service, and similarly worn out, had an average mileage each of 265,000, or a ratio of 4.71 to 1 in favor of the steel wheel; 265,000 miles is a very conservative estimate for steel wheels, because individual records of wheels show mileage as high as 380,000; showing what, under proper conditions, can be looked upon as a possibility.

The average mileage of a cast-iron chilled wheel in freight service was found to be 76,260. There were no steel wheels used for freight purposes; but if we assume that the proportion between the life of a steel-tired wheel and a cast-iron chilled wheel remains the same, whether in passenger or freight service, the average life of a steel-tired wheel, under a freight car, would be 360,000 miles, or representing a life of over 35 years.

The above mileages are based upon the practice of the average wooden 60-000-lb. car, and must be greatly modified when applied to the modern 55-ton car. It has been stated by the representatives of one of the greatest freight-carrying railroads of the country, that the average mileage of a cast-iron wheel, when carrying the large capacity steel car, is about 35,000; and if we use this figure as a basis, the life of a steel wheel should be in data previously given. Using these two figures as a the neighborhood of 150,000 miles when based upon the foundation for a financial comparison, the following data explains itself:

Assume as average service of cast-iron wheels (miles)	35,000
Assume as average service of steel wheels (miles)	150,000
Assume as cost per wheel of cast-iron wheels	$8.75
On this basis the cost of each 150,000 miles of service, with cast-iron wheels, would be	$37.45
Less scrap value of about 4.25 cast wheels at 70 cents per hundredweight	17.98
Net cost for 150,000 miles with cast-iron wheels	$19.47

Adding to this last figure the value of a scrap steel wheel, which is about $5, we find the allowable price for a wheel of this type to be $24.47, not allowing for any other saving due to immunity from wrecks, as caused by defective cast-iron wheels, etc.

In the above it has also been assumed that the boring and mounting of the different cast-iron wheels is about equivalent to the "truing up" of the steel wheel.

Another point, which may be worth mentioning in this connection, is the fact that as the cast-iron wheel weighs at least 700 lbs., while the steel wheel weighs about 80 lbs. less, there is a saving in dead weight per car of some 640 lbs.

The process as used in the manufacture of our new wheel is about as follows:

A round ingot, approximating in outlines the shape of a wheel, but of a quite smaller diameter and greater web thickness, is placed in a movable bottom die-holder of a 5,000-ton forging press, where the blank is first reduced in thickness. During this same stroke the hub is forged and finished and the hole punched—all in one operation. The original blank or ingot is about 4 in. less in diameter than the finished wheel, and its central body has a thickness of from 2 in. to 2¼ in., which is reduced by rolling to a final web thickness of wheel of from ⅞ in. to an inch.

The forging press consists of a large bottom cylinder located below the floor, working through vertical, hollow-forged nickel steel 15-in. bolts on a movable cross-head, to which the top die is attached. The bottom die-holder is stationary from a vertical point of view; but is operated horizontally by a hydraulic cylinder, so as to facilitate the introduction of the blank and removal of the finished product. Above the forging cross-head with its top die, is located another large hydraulic cylinder in which works a piston, the lower end of which engages into the cross-head and is guided by the same. This piston performs two functions, viz., first, of punching the hole, after which the piston continues downward, coming to a stop inside the forging cross-head, adding its pressure to that already existing upon the top die, and hence finishing the hub under the combined pressure of the two rams, which amounts to about 5,000 tons. The punches are not stripped; but they are split automatically, leaving the lower half remaining in the wheel blank, and this is afterwards removed before going to the rolling-mill. Most of the mechanism is automatic, and hydraulic cranes are attached so as to minimize labor.

The two conical rolls of the rolling-mill are driven by a 1,000-h.p. engine. Electric alarms call the attention of the operator when the thickness of the web and the rim have reached their limit. The work of the actual rolling process consumes from one and one-half to two minutes.

The third and last step is the coning of the wheel, which is done in a separate 1,000-ton press that is provided with the proper dies and handling mechanism. In this machine the rim is pushed downwards so as to give the proper relation between the edge of the hub and the edge of the flange, and it should be added here that this peculiar shape of the wheel furnishes a small degree of elasticity, which is beneficial under load. The entire three processes are performed in one heat, and the transportation machinery, from furnace to press, from press to rolling-mill, and again from the rolling-mill to the last press, are all worked out so as to be as near as possible automatic, and will reduce the entire complement of workmen, including heaters and boys, down to about ten or twelve, this number also covering the men who are handling and distributing the cold blanks previous to charging.

It is natural that, in order to secure a homogeneous metal in the rim, it is of interest not to have too much material congregated at that particular place. From financial reasons one would arrive at the same result; because when considering the long life of a steel wheel, the increased first cost, with its compound interest, due to the carrying of this additional thickness for a number of years, will tend to counteract whatever benefits might be derived by having a little longer life. It must also be remembered that, as the wheel is a solid finite and self-contained structure, with the rim rigidly connected to the web, it is possible to run with a thickness of rim that would be absolutely prohibitory with a tire, because in this latter case such a thickness, not being backed up by anything but its own inherent strength, would be stretched by the rolling action and become loose on its center.

It must be understood that the great underlying purpose for the introduction of the solid steel wheel is not directly one of competition with the center and tire construction; but is rather to be considered as a forward step in the freight trade. And with this in view, it is pertinent to say that should it even be impossible to claim the same amount of molecular work done on the metal, and also the same high excellence generally for the solid steel wheel as that which is claimed for the steel-tire construction, the difference would be so small as to be of little account when considered in the light of the difference in the market prices of the two products.

If it is of great importance to have a maximum amount of work done on the metal, it is even still more necessary to have a metal of the proper chemical composition. With this in view, inquiries were made in the engineering department of a large trunk line to ascertain which composition of tire produced the best result, realizing what was good for a tire would naturally be equally good for a solid steel wheel.

*Extract from a paper read by Mr. Henrik V. Von Z. Loss, M. Am. Soc. M. E., before the Franklin Institute.

The mileage of several compositions were given, and the comparison between them resulted in a metal which is our present standard, and which runs about as follows:

	Per cent.
Carbon	about .7
Manganese	.65 to .70
Silicon	.3
Sulphur and phosphorus, both below	.05

The physical test showed an elongation of about 13 per cent. in 2 in., with a contraction of about 35 to 40 per cent., and an ultimate of about 125,000 lbs. per sq. in. According to a catalogue published by a leading manufacturer of steel tires, this compares as follows with English practice:

English Practice.

	Per cent.
Carbon	.65 to .75
Silicon	.20 to .25
Phosphorus	under .05
Manganese	.50 to .55
Sulphur	under .045

Physical Test of Steel of Above Analysis.

Tensile strength	115,000 to 125,000 pounds
Elastic limit	55,000 to 60,000 "
Elongation	10 to 15 per cent.

It has been said that the introduction of the new steel wheel would force railroads to purchase and operate lathes to an extent that would be prohibtory in order to keep the steel wheel up to its standard. If the life of a steel wheel, with all its turnings, were no greater than the life of a cast-iron wheel, such arguments would be true. But if the time between the turnings of the steel wheel represents a mileage equal to that of a cast-iron wheel—which it should do—there would be no more dismantlings than at present exist in ordinary car practice. This statement is based upon cast-wheel mileages of 70,000; but, as previously mentioned, the experience of at least one of the great trunk lines has cut this figure down to from 30,000 to 40,000 miles when operated in connection with the 100,000-lb. cars, and in such a light the dismantlings for the steel wheel are of still less importance.

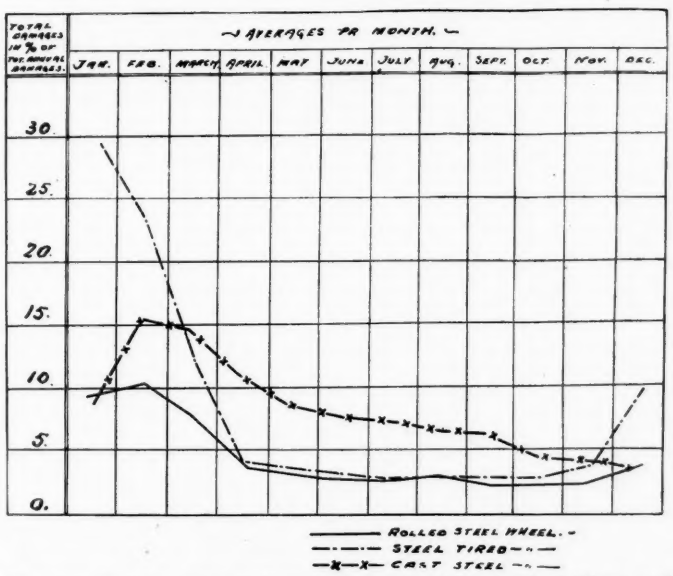


Diagram Showing Comparison Between Cast Steel, Steel Tired and Rolled Steel Wheels.

It has also been argued that good cast iron represents a metal for wheel purposes which is superior to steel, as it flakes less and, barring the question of strength, is a better all-round metal when provided with a chilled rim. I am not here to belittle the merits of the cast-iron wheel; on the contrary, its introduction, with its many magnificent qualities, enabled industrial progress to an untold degree; but, unfortunately, as competition became greater less care was used in the selection of the iron, and instead of having a metal of charcoal material, with an ultimate resistance of from 30,000 to 33,000 lbs., the wheels of to-day are made of iron ranging between 20,000 and 22,000, and at times hardly that. Such is the fact independent of any theory, and it is with this low-grade wheel that we have to deal.

I do not deny that it may properly be asked: If a better cast iron were substituted, what would be the result? The most pertinent reply that can be given to this query is, that all would have been well and the steel would not have become a necessity, if the world had not seen the introduction of the steel car. It goes without saying that when frogs and switches actually prohibit the increase of dimensions only one other alternative exists, namely: increase of tensile strength; and this last step in the evolution of the car wheel became, hence, a necessity, and, as I also trust, has now become an accomplished fact.

Barring the records of individual railroads, no concerted action has been taken in this country to keep and maintain a national record of the life and accidents to railroad wheels. In Germany, an association was formed about 10 to 15 years ago which included the German State Railways, the Austrian-Hungarian State Railways and a few independent roads. This association has taken a great deal of care in the matter of wheels, comparing damages to different constructions as well as to different metals. There are, of course, no rolled steel wheels in their territory; but a number of cars, with a few locomotives and tenders, have been equipped with solid cast-steel wheels, and it is interesting to note the results, though their number is somewhat too small to form very conclusive opinions as to details.

During the years 1887 to 1896, the total number of tired wheels varied from 1,700,000 to 2,300,000, while the total number of solid steel wheels commenced at 340,000 and increased to 375,000, most of which latter were, as already mentioned, placed under cars generally carrying freight. It was found that the percentage of loss—this includes cracks and fractures—in the steel-tired wheels was about .18 per cent. in 1892, increasing up to .22 per cent. in 1894 and 1895, while with the solid steel wheels during the same period, the total loss was about one-half of 1 per cent. In steel-tired wheels the relation of cracks to fractures was about 7 to 10, while with solid wheels the fractures were so rare that as a matter of comparison they can be ignored. This indicates clearly, from a point of general result, the superiority of the forged and rolled rim as compared to that of the coarse, crystalline cast metal.

The German report furnished some data on the question of temperature which may be of interest to our profession in this country. The total damage done to steel-tired wheels during any one summer month, as compared to the month of January, is one to ten. This heavy mid-winter destruction lasts only for a short time, reaching its maximum during the month of January, while during the five summer months the minimum will remain practically constant. With solid steel wheels this relation was as one to four, showing the beneficial result of a solid web. The German data indicated that the maximum damage was done with heavy tires, which I naturally suppose means that if a tire is imperfect will develop shortly upon the wheel being placed upon the road. Illustrating this point, the following figures give a very interesting summary (the total damage done being considered as 100 per cent., including fractures and cracks, and the wheels representing the sum of both types, cast steel as well as steel tired).

Six per cent. of all the damage was done on mileages above 190,000; 30 per cent. was done on mileages between 100,000 and 190,000; 23 per cent. was done on mileages between 70,000 and 100,000, and 25 per cent. was done on mileages between 35,000 and 70,000.

The lessons derived from the above data, and as taught us by our German fellow engineers, would certainly seem to warrant us in drawing the conclusion that the solid forged and rolled steel wheel would have a rim which should possess very many of the meritorious qualifications of the steel tire, coupled with the advantages and the inherent strength afforded and shown by the web of the solid cast-steel structure.

The accompanying diagram shows graphically the effects of temperature on wheel damage, and also compare the respective damages to rolled steel, steel-tired and cast-steel wheels. The German data are used for the last two, while the line for rolled steel is a theoretical construction, based on the same methods.

DISCUSSION.

MR ARTHUR FALKENAU: I should like to know from Mr. Loss of what kind of material the punches are made.

MR. LOSS: After a number of experiments we decided in favor of fairly hard cast iron as possessing the best average combination of durability and cheapness.

MR. W. VOLLMER: I should like to ask Mr. Loss about the number of wheels at present in service. Also about their length of service and the mileage covered as well as their general efficiency.

Mr. LOSS: Last June about 30 experimental wheels were placed under locomotive tenders on different railroads and for different purposes. Fast express trains, accommodation passenger trains (some of these latter running on mountain roads) and heavy freight were all included. From 25,000 to 35,000 miles, depending upon the character of service, was the average mileage before turning, and the general wear as taken from plaster casts was very good. The master mechanics handling the wheels have informed me that their behavior on the road or in the lathe in the machine shop was the same as that of an ordinary steel-tired wheel. We have lately started our works in Pittsburg, and during the last month from 900 to 1,200 additional wheels have been shipped and are daily being placed on the different roads.

MR. E. B. HALSEY: What is the percentage of carbon used in the steel, and do you start from a blank or from blocks of steel cut from the ingot?

MR. LOSS: The percentage of carbon is about .70, and the ingots are, as previously described, at present run separately. They are round, with varying thicknesses, and there is no doubt but what we shall shortly run them in multiples. Not being a mere steel casting, we use no sink-heads, but fall back upon the great pressures exerted upon the metal in the two processes and the rolling mill to solidify it. The pressure on the rim while rolled is equal to that existing in the largest tire-mill of to-day. A great deal of time and expense were bestowed on the subject of how to cast the ingots, resulting in the adoption of some very interesting methods. Our uniformity in product has been greatly advanced by this knowledge.

Railroad Fusees.

BY J. C. RAMAGE AND LEWIS CHEESEMAN, SR.

Fusees, red or green, used to notify the crew of a train of the fact that a preceding train has passed on the same track within a given short interval of time—usually not more than ten minutes—are properly regarded by most railroads as an important article, forming, as they do, part of their system of signals. Accordingly, in ordering, while a "good" fusee is always contemplated, the attention the subject warrants is not always given to see that such is obtained, and not infrequently a fusee that under favorable circumstances will burn for ten minutes with a fairly good color, is the limit of the requirements insisted upon. That such fusees are not "good" fusees in several senses of the word will, we think, be quickly evident from a little study of the subject. Aside from the unsatisfactory service given by the average fusee—a large percentage failing to ignite promptly, going out by breaking or from other causes when thrown from trains, etc., with the attendant danger involved in such failures—such fusees are not at all unlikely to cause serious loss from fire by their spontaneous ignition in storehouses and elsewhere. Fusees have such a bad reputation generally as breeders of fire that some roads have felt compelled to discontinue their use entirely. An investigation to determine the cause of several fires supposedly due to the spontaneous ignition of fusees, led to a general study, which developed some points that may be of interest and of value to those interested in this form of signal. So far as we are aware, technical literature is practically silent on this subject. The present paper deals first with the composition and mechanical construction of fusees from the standpoint of safety from the likelihood of spontaneous ignition or premature ignition from some form of accidental friction—for it is certainly desirable that danger from fire from fusees should first be eliminated so far as possible—and then takes up the further requirements which actual service demands of a really good fusee.

In beginning our investigation, admitting our own ignorance, we sought suggestions from several old and reputable fusee manufacturers as to where we should look for the seat of trouble. While all kindly responded with their respective formulas, and evidently gave us all the information on the subject at their command, we were met by the fact that although each maker assured us that no danger from spontaneous ignition was to be feared from fusees of his make, without exception they were unable to give any real reason for "the faith that was in them," nor could they suggest any test or method by which dangerous fusees could be detected beforehand from reasonably safe ones. Groping, therefore, at first in the dark, by the process of trial and elimination, aided by a suggestion of Prof. Munroe, of Columbian University, Washington, D. C., to whom our acknowledgments are due, we were ultimately forced to the conclusion that the spontaneous ignition proper of the ordinary commercial fusee was largely if not wholly dependent upon the existence of free acid in the powder. Later experience has served to confirm this conclusion. Certain compounds are what are known as chemically active; that is, in the presence of other compounds they tend to react with these to form new and different compounds. Among these chemically active substances the acids take front rank, and it is a well known fact that their reactions usually give rise to a generation of heat. If, therefore, free acid be present in the fusee "mix" (as the powder of the fusee is technically known), more or less heat will be evolved within the tube by the reaction of the free acid on the other chemicals. If the percentage of free acid is comparatively small, heat is not likely to be generated very rapidly, but the paper cover, acting as a non-conductor, largely prevents the dissipation of such heat as is formed, and there is thus a gradual increase of temperature, sufficient, when other conditions happen to be just right, to cause the spontaneous ignition of the quite inflammable powder, of which the fusee must at best be composed. Free acid, as such, is, of course, not knowingly added to the original mix, but may, nevertheless, still be present to an undesirable amount, due either to the use of impure or improper chemicals. A poor grade of sulphur carries a considerable amount of free sulphuric acid, and most of the cheap gums—used sometimes as a substitute for pure shellac—also contain an appreciable amount of free organic acid. But by far the greatest factor in the spontaneous ignition of fusees is believed to have been the hitherto almost general use of the chemical ammonium chloride, commonly called sal ammoniac, as one of the elements of the mix. Although generally supposed to be a neutral salt, that is, one having neither an acid nor an alkaline reaction, sal ammoniac is in fact, as can easily be determined by test, a highly acid salt. In the study of spontaneous combustion it is rather unusual to witness the phenomenon itself without accentuating the conditions under which the ignition ordinarily takes place. So highly inflammable,

however, was at least one make of fusee regularly on the market, that we had, what to us as students of the subject, was the pleasurable experience of actually witnessing the spontaneous ignition of the powder of a fusee which had been taken from a regular shipment and was being held in the laboratory for experimental purposes. The powder in question was first noticed to be giving off a greenish-yellow gas, having a very irritating odor. Later, it burst into flame. Analysis of some of the same powder showed it to be high in free acid and to contain a comparatively large amount of sal ammoniac. That this is the chemical whose use has given fusees their generally bad reputation as fire breeders is further proved, we think, by the fact that different standard fusee mixes to which this salt in excess was added experimentally, first gave off the greenish-yellow gas noted above and then, after varying periods, ignited spontaneously, in a number of instances. We quote in this connection from Remsen's Inorganic Chemistry, page 121: "Chlorine dioxide is a greenish-yellow gas of great instability. . . . It is always one of the products of the action of concentrated sulphuric acid upon potassium chloride. When moderately dilute hydrochloric acid acts upon potassium chlorate a greenish-yellow gas is formed, which has been called euchlorine. It is a mixture of chlorine and chlorine dioxide. . . . *Combustible substances burn in chlorine dioxide with violence.*" Potassium chlorate is always an ingredient of fusee mixes. If, therefore, the sulphur used be not free from sulphuric acid, or if sal ammoniac be present to furnish hydrochloric acid, the combination is one pregnant with danger. In passing, it may be stated that we understand that the use of sal ammoniac in powder or other explosives is prohibited by law in England.

For the reasons given, therefore, we believe that fusees known or found to contain sal ammoniac or free acid in any form should at once be condemned, without regard to any good qualities they may otherwise have. As before stated, in beginning our investigation, we were met by the fact that there did not seem to be any known test or method by which fusees likely to ignite spontaneously could be distinguished beforehand from reasonably safe ones. As at least partially "filling a long felt want," therefore, we venture to suggest the following simple tests for this purpose, based on the conclusion from the results of our investigation in this particular, that the amount of free acid in a fusee is largely a measure of its liability to ignite spontaneously.

Test for Ammonium Salts—Dissolve several grams of the fusee powder in a minimum amount of water. Add a few cubic centimeters of concentrated caustic potash solution. Heat gently. If any ammonium salts are present, they are easily to be recognized by the characteristic odor of the ammonia, which will be driven off, or by the use of red litmus paper. If the presence of ammonia is detected, the fusees represented should be condemned at once.

Note.—While all ammonium salts are a source of danger, if the reaction for ammonia is obtained in the above test, it indicates the probable presence of ammonium chloride, as this is the only ammonium salt likely to be used in a fusee mix. This salt can be further identified if necessary by the silver nitrate test; that is, the addition of a few drops of silver nitrate to the water solution of the fusee powder. If ammonium chloride be present a flocculent white precipitate will be formed.

If no trace of ammonia is found, for the detection of any other acid that may be present, proceed as follows:

Digest 40 grams of the fusee powder in 100 cubic centimeters of distilled water. Boil for five minutes. Filter and add a few drops of neutral phenol-phtaline indicator. Titrating then with quarter-normal alkali, it should not require more than .5 cubic centimeters of this solution to neutralize the free acid present in the filtrate.

Note.—Quarter-normal alkali solution is a standard solution familiar to every chemist. Directions for making it up can be found in Sutton's Volumetric Analysis, page 58.

The amount of free acid present in a mix can easily be determined to a small fraction of a per cent. by the above method. The requirement that it must not take more than .5 cubic centimeters of quarter-normal alkali solution to neutralize the acid in 40 grams of powder is somewhat empirical, but is believed to be a safe limit. As a matter of fact, however, there are now on the market makes of fusees which contain even less than half this amount of free acid. Other things being equal, such fusees should be given preference.

As explained above, our experiments and investigations lead to the belief that it is heat generated within the tube by chemical action, that is the primary cause of the spontaneous ignition of fusees. The safety of a fusee mix cannot, therefore, be determined by simply subjecting it to some form of external heat, rapidly raising the temperature and noting whether ignition takes place at a point appreciably above the maximum temperature to which it will likely ordinarily be subjected. On the other hand, as chemical action is, as a rule, stimulated by heat, and as even the best of fusee mixes contain some free acid, fusees should be kept in a cool and well ventilated place. If on the general score of safety they are stored separately from other stock, if kept out of doors, they should be protected both from the direct heat of the sun and from dampness. In this connection, it may not be amiss to also call attention to the lack of care with which fusees are often handled in train service. Not infrequently they are simply dumped into a box along with tools, waste, etc., or else, having no fixed abiding place, are soon to be found scattered about the floor of the caboose, to be kicked hither and thither. Aside from the danger from fire and the probability of not having a servicable fusee at hand when one is badly needed, this is a wasteful practice, and economy alone would dictate the desirability of equipping cabooses with racks especially designed for holding fusees or else supplying flagmen with separate boxes of appropriate size and shape to be used solely for storing fusees.

Taking up now the mechanical construction and service requirements generally of a really good fusee, almost every make of fusee has some particular device or detail of construction on which the manufacturer lays great stress. Some of these are of undoubted value—others serve largely as "talking" points. In the manufacture of fusees, however, like in everything else, there are a number of details not likely to attract particular notice, but on the attention paid to which depends to a large extent the efficiency and value of the fusee. Some of these and of the general requirements of a good fusee we venture to touch on below:

Size—The proper diameter of fusees is a matter of individual preference. Other things being equal, the size of the flame is roughly proportional to the diameter of the tube. From 7/8 to 7/8 of an inch inside diameter are the sizes most generally used. The length of the tube may vary somewhat, but fusees, the tubes of which measure less than 12½ or 13 in. long for the ten-minute size, or 7 in. for the five-minute size, should be carefully tested further to see that they have the desired "force" (see below).

Time of burning and color—It is of vital importance that fusees should burn full ten minutes, or whatever may be the specified burning life. Fortunately, however, it is a simple matter to determine definitely whether a fusee meets the requirements in this respect, an actual burning test, noting the time of ignition and extinction, being all that is necessary. The same samples can be used to note the brilliancy and depth of color of the flame. There is no definite way to measure this, comparison of the color of the fusee under test with that obtained from other fusees, being the only available method. It is important, however, for reasons which appear below, that the color of fusees be observed from a considerable distance, say, not less than one-half mile.

Force—This is the technical term used to designate the strength or power with which fusees burn, that is, the holding power of the flame and intensity of the light which it emits. While two fusees, one of which contains the proper percentage of chlorate of potassium, or other oxygen-giving chemicals, but in the other of which some of these have been replaced by a "filler," that is, by comparatively inert material, may, when viewed at short range, apparently give equal illumination, when viewed at a distance, a difference in the two lights is at once noticeable. The latter light has not the power or intensity of the former, and hence, as compared to it, appears relatively dim and of small volume. The force of a fusee, therefore, not only affects its efficiency as a signal, but is also an important factor in the tenacity with which the flame holds, that is, resists being extinguished, should it chance to fall in a snow bank or puddle of water when thrown from the rear of a train. Force, while perhaps not definitely measurable, can be satisfactorily determined by the simple expedient of dipping the fully lighted fusee in a bucket of water. Strange as it may seem, a fusee having a properly compounded mix rich in potassium chlorate will burn indefinitely under water, while one deficient in these respects will be immediately extinguished under like conditions. It is somewhat startling to see a fusee actually burning under water, but the explanation of the paradox is the simple one that the chlorate and nitrate of the mix, themselves supply the oxygen necessary for combustion.

Heading—It is, of course, necessary that the priming material should be in close contact with the powder proper. It is also essential that it be so compounded and mechanically fastened in the tube that it will not pop out or "skyrocket"—a not unusual defect, but a very dangerous one, putting in jeopardy, as it does, the face and clothes of trainmen or others handling fusees. Test should also be made to see that the heading is neither too "quick" nor too "slow." From the instant of ignition to the time the powder is fully lighted should be about five or six seconds.

Tube—One serious defect of the average fusee is that when thrown from a train the tube is often broken by contact with the ground. It is, therefore, desirable to have as strong a tube as conditions permit. The actual strength of the tube can be measured by placing the fusee on supports, a given distance apart, and applying a load with a spring balance. With supports 11 in. apart, a good fusee should withstand a load of at least 50 lbs. gradually applied at the center. In endeavoring to secure a strong tube, however, care should be taken to see that the tube does not "chimney" unduly; that is, that the burnt portion of the tube does not tend to form a cylinder around the flame, thus obstructing the light to some extent. With a tube of the strength noted above, if the mix is rich in chlorate of potash, the burnt paper will fall away as the chemicals are consumed. Chlorate of potash is the life essence of a fusee mix, but as it costs a little more than some relatively inert ingredients, it is often used as sparingly as possible.

Scratch—It is, of course, essential that the scratch should be damp-proof. It should also be so located with regard to the heading as to make it improbable that the fusee should be accidentally ignited. Almost every fusee manufacturer has his own method of accomplishing these results. Personally, we think a very satisfactory arrangement is that where the scratch is located on the end of the cap and protected by a piece of tape or cloth, this in turn being covered by water-proof paper, the tape should extend beyond the edge of the paper, so that the scratch can readily and conveniently be exposed when desired.

Miscellaneous—A number of relatively minor points of construction might also well be noted, for instance: It is desirable that the under side of the wooden button of the cap should be concave, so as to prevent contact with the heading; the bottom plug should be ribbed and securely fastened to the tube, the paper cap should fit the tube snugly, and generally the workmanship of a fusee as a whole should be good.

The essential and some of the desirable features of an up-to-date fusee may now be summarized as follows:

1. The powder must contain practically no free acid.
2. Must burn the full specified length of time.
3. Must have a strong flame ("force"), with well defined color.
4. Heading should be neither too "quick" nor too "slow" and mechanically fastened in the tube.
5. Should have a strong tube, but one that will not "chimney."
6. Scratch should be damp-proof and properly located.
7. Minor details of construction, as noted above, should have received attention.

We have gone into the subject of fusees here somewhat in detail, both because of its importance and in the belief that a better knowledge of the actual service conditions that fusees must encounter would be to the mutual benefit of both makers and users of this article. While the requirements, as indicated above, for an up-to-date good fusee, may at first glance seem rather formidable, as a matter of fact there are now fusees on the market meeting all these requirements, and at a cost but very little, if any, in excess of that commanded by much inferior grades. The use to which fusees are put necessitates such an inflammable compound at best that there is always possible danger from their use—a single improperly compounded or mechanically defective fusee being likely to start a fire if the conditions happen to be just right. However, the requirement that fusee powder must contain no free acid will certainly eliminate at least one hitherto frequent cause of fires, and fusees which also conform to the other requirements enumerated, should likewise prove much more satisfactory and, if handled with reasonable care, more economical than those constructed without due appreciation of the service requirements of a really good fusee.

The Naval Appropriation Act.

As finally agreed upon by Congress and approved by the President on April 27, the Naval appropriation Act provides for one first-class battleship of not over 16,000 tons displacement and to cost, exclusive of armor and armament, not more than $4,400,000; two first-class armored cruisers of not more than 14,500 tons displacement and to cost not more than $4,400,000 each; three scout cruisers of not more than 3,750 tons displacement and to cost not more than $1,800,000 each, and two colliers capable of accompanying a battle fleet, to carry 5,000 tons of cargo coal and to have a trial speed of not less than 16 knots and to cost not more than $1,250,000 each. The colliers shall be built at Navy Yards, one on the Pacific and one on the Atlantic coast, to be designated by the Secretary of the Navy. Of the other ships authorized, not more than two shall be built by any one contractor.

Among the more important items carried by the bill are the following: On account of hulls, and machinery, and steam machinery, of ships previously authorized, $19,826,860 is appropriated; for armor and armament of domestic make for ships authorized, $12,000,000, and for completion, repairing and preservation of boilers of naval ships, including new boilers, distilling, refrigerating and auxiliary machinery, etc., in all for steam machinery under the Bureau of Steam Engineering, $3,405,000.

For an extensive series of tests and for original investigation and research, in connection with the determination of the efficiency, economy, adaptability and endurance of the steam turbine for naval purposes, $25,000.

For machinery plant, Navy Yard, Boston, Mass., necessary to furnish new power plant and a number of locomotive cranes, $75,000; and for machinery plant, Navy Yard, Norfolk, Va., new and additional tools for pattern shop and foundry and for condensing apparatus for the new power plant, air compressors and locomotive cranes, $50,000.

For the purchase of land and the establishment of a naval training station on the Great Lakes, $250,000; and the President is authorized to appoint a Board of three members from States not bordering on the lakes, to select the most available site on the Great Lakes and to ascertain and report its probable cost and the probable necessary expenditure for improving the same, including lake protection and harbor facilities, and to make a report in detail to the President who, upon approval of such report, shall authorize the purchase of the site and establishment of the station. For the expenses of the Board $5,000 is appropriated to be immediately available.

For the purchase of land for a new magazine on or near the New England coast north of Cape Cod, and toward the necessary buildings, grading, wharves and cranes, railroad tracks and rolling stock for local service, and fire and water service, $70,000; and for expert services of architects, surveyors, etc., and for plans and

specifications $15,000 additional, and the total cost of the magazine shall not exceed $500,000.

Some of the work authorized at the various naval stations under the Bureau of Yards and Docks, is as follows:

Navy Yard, Portsmouth, N. H.—Railroad and rolling stock additions, $8,000; electric plant extensions, $35,000; railroad and wagon scales, $8,000; electric elevators, $8,000, and various other items, in all $149,000.

Navy Yard, Boston, Mass.—Railroad system extensions, $20,000; electric light plant extensions, $20,000; underground conduit system, $15,000; approach to dry dock No. 2, $50,000; wire-rope mill, $65,000, and various other items, in all $256,800.

Navy Yard, New York, N. Y.—Railroad system extensions, $10,000; railroad equipment, $10,000; cranes, $7,500; underground conduits, $30,000; granite and concrete dry dock, to continue, $200,000; prison on Cob Dock, $50,000, and other items, in all $371,500.

Navy Yard, League Island, Pa.—To continue retaining wall, $80,000; railroad system extensions, $5,000; to continue dredging and filling in Delaware water front, $30,000; sea wall extension, $50,000; locomotive crane track extension, $30,000, and other items, in all $512,970.

Navy Yard, Washington, D. C.—To complete building for power plant extension, $135,964; coal storage and handling plant for power plant, $19,084; machinery for power plant, $205,200; one locomotive crane, $10,000; one 150-ton platform scale, $3,675; building for electric power plant, $97,983, and, including other items, in all $575,906.

Navy Yard, Charleston, S. C.—Appropriations are made to complete various large buildings now under way; and to continue work on the stone and concrete dry dock $300,000 is allowed, the total for this yard being $706,500.

Navy Yard, Norfolk, Va.—Railroad tracks, extensions, $5,000; electric crane, $15,000; railroad rolling stock, $3,000; piers and slips, $100,000; to continue work on granite and concrete dry dock, $250,000, in all $959,000.

Navy Yard, Mare Island, Cal.—Railroad system extensions, $15,000; electric plant extension, $25,000; improvement of channel, $150,000, and other items, in all $260,000.

Navy Yard, Puget Sound, Wash.—Railroad and railroad equipment extensions, $16,000; extension of dry dock boiler plant, $15,000; to complete locomotive crane and track about dry dock, $50,000, and other items, in all $292,500.

Navy Yard, Pensacola, Fla.—Central power house (to cost $104,000), $60,000; tools, $2,000, and other items, in all $94,000.

Naval Station, New Orleans, La.—Railroad system, $25,000; electric light and power plant, $37,500; shops for steam engineering and fittings, $35,000; improvement of water front, $45,000, and other items, in all $271,500.

Naval Station, Guantanamo, Cuba.—Dry dock, $200,000; dredging and sea wall at Toro Key, $115,000; reservoir and water system, $50,000; in all $385,000.

Naval Station, Cavite, P. I.—Floating steel dry dock, to continue, $725,000, and improving prison, $10,000, in all $735,000.

Naval Station, Olongapo, P. I.—Toward building quay walls, $63,000; pier for landing stores, $100,000; toward coaling plant, $500,000, and various other buildings, quarters for officers and men, dredging, etc., in all $862,395.

The Secretary of the Navy is authorized, in his discretion, to consolidate the several power plants in any or all navy yards and stations for the generation and distribution of light, heat and power, and to carry out this provision $300,000 is appropriated. Toward the construction of new buildings and all improvements at the Naval Academy, $3,000,000 is allowed.

For target practice and gunnery exercises $120,000 is allowed; for the purchase and making of smokeless powder, $500,000; for machine tools under the Bureau of Ordnance, at the navy yards, Portsmouth, N. H.; Boston, Newport, R. I., and Lake Denmark, N. J., $16,000, and for new and improved machinery and equipment under that Bureau at the Washington Navy Yard, $120,000.

To buy land and establish coaling depots, $600,000, and for the purchase of coal, including expenses of transportation and storage, $2,750,000 is appropriated.

The total carried by the bill as it passed the Senate was over $97,000,000, but as finally agreed upon in Conference Committee the total amount is somewhat less.

A Form to Accompany Time Freight.

The great increase in the amount of railroad business in the past few years has demanded some arrangement whereby rush cars may receive special protection without the necessity for issuing specific telegraphic orders and tracers in each case. To meet this requirement, the Car Service department of the New York Central has recently put in service what is termed the "Protected Freight Wrapper" (Fig. 1). This form is in reality a heavy envelope in which the regular running slip, mem. bill, or waybill, as the case may be, is enclosed at the shipping or junction point, and the information called for shown on the face of the wrapper. The instructions provide that forwarding agents will use protected freight wrappers for enclosing slip-bill only when so designated on loading order or specially authorized. Car number and initial must correspond with slip-bill enclosed, and if billed destination of the car is a station on the New York Central, the station named is shown on the line reading "To ———," but if billed destination of car is on another line, the junction station where car leaves New York Central rails is shown, and also initials of road to which the car is to be delivered. The symbol or train number, including switch movement, of the train which takes car from point of origin, followed by connecting train symbols or numbers, as noted on loading order or specially authorized, is required to be shown on line provided for the purpose. The back of the wrapper is printed (Fig. 2) with a space to be filled out by conductors in case the protected car is cut out in transit, crippled, or for other reason. There is also a space in which agents or yardmasters are required to explain any failure of the car to make designated train connections at division terminals.

Agents number all wrappers, beginning with No. 1 on the first day of each month, and also render to the Car Accountant a daily report of all wrappers issued. Agents at destination receiving cars with slip-bills enclosed in protected freight wrappers are instructed to remove bills and forward the wrapper promptly to the Car Accountant, noting thereon time car is placed on unloading dock, if containing L. C. L. freight. When protected cars are destined beyond the line of the New York Central the agent or yardmaster at junction station removes the mem. bill, which goes forward with the car, noting date and time of delivery to connecting line, and forwards wrapper to the Car Accountant. The wrappers thus received are checked up with the reports made by issuing agents and any failure to handle the car properly and on the trains designated is taken up with Division Superintendents for investigation and report.

In the example shown in Fig. 1, the car is loaded and forwarded from Rome, N. Y. (252), and moves to Utica (U) on pick-up train DU-4. Here connection is made with solid train for West Albany (A), symbol UA-2. At West Albany the car is scheduled for forwarding on through Buffalo-New York fast freight BN-8, which is due at Sixty-fifth street, New York (0), at 2 a. m. the following day, giving time to get the car on the floats for delivery station, Barclay street, ahead of the dairy trains, also due in the early morning, thus insuring second morning delivery at New York. This plan of protected freight has been found to do much to insure fast regular service on the certain cars requiring prompt movement.

Form C. A. 5600

PROTECTED FREIGHT

NEW YORK CENTRAL AND HUDSON RIVER R. R.

NYC. Car No. 56888

To Barclay St. New York

For Delivery to _____ R. R.

Date April 1st Wrapper No. 1

INITIAL AND CONNECTING TRAINS.

DU 4 - UA 2 - BN 8.

DEPARTED				ARRIVED		
FROM	Date	Train	Time	At	Date	Time
252	4/2	DU4	1 am	U	4/2	23 am
U	4/2	UA2	4 am	A	4/2	11 am
A	4/2	BN8	10 pm	O	4/3	2 am
Arr. Barclay St by Hook						6 am

Delivered to _____ R. R.

Date _____ Time _____ M

Conductors handling this car must enter in spaces provided, the station number or letter where car is taken and left, also date, train, and actual time taken or left.

If, for any reason, car is cut out short of destination or train terminal, notify the Superintendent at once by telegraph, advising that it is protected car, and make proper record on back of this wrapper.

Agents, Yardmasters, and others handling protected cars must see that they are moved on designated trains as noted, or, if such connections are not made, the reason why must be shown on back of wrapper.

Protected cars must have preference on trains to which they are assigned over all other cars except those loaded with live stock or perishable freight.

When consigned beyond this line, delivery to connection must be made promptly after arrival at junction station.

J. P. BRADFIELD,
General Superintendent.

PROTECTED FREIGHT

Fig. 1.

TURN FLAP INSIDE OVER SLIP BILL

THIS CAR CUT OUT WHILE IN TRANSIT:

AT	DATE	REASON WHY	CONDUCTOR

Notations of Agents or Yardmasters when car fails to make designated train connections at division terminals.

On arrival at destination or junction station where car leaves this line, remove slip bill and forward this wrapper promptly to Car Accountant, New York.

Fig. 2.

Freight Wrapper—New York Central.

TECHNICAL.

Manufacturing and Business.

The general offices of the Chicago Car Heating Company have been moved to the Railway Exchange.

The Baker City (Ore.) Engineering Works will build an addition to its plant and put in new machinery.

Julian L. Yale & Co., Chicago, have removed their offices from the Monadnock Building to suite 619, Railway Exchange.

One thousand tons of 30-lb. relaying rails are wanted in North Carolina by Joseph E. Bowen, Atlantic Office Building, Norfolk, Va.

The Automatic Car Ventilator Company, 39 Cortlandt street, New York City, will soon be in the market for equipment for its proposed shops.

The Cyclopean Iron Works, of Jersey City, N. J., has been incorporated with a capital of $100,000 by William F. Jones, Allen S. Lozier and J. J. Harold.

T. F. De Garmo is representing the Flannery Bolt Company, Pittsburg, Pa., makers of the Tate flexible stay bolt, in the west, with headquarters in Chicago.

The Independent Railroad Supply Company, Chicago, has received an order for about 10 miles of Federal tie plates from the Chicago, St. Paul, Minneapolis & Omaha.

The Ridgway Belt Conveyor Co. has been incorporated in New York with a capital of $100,000. The directors are T. E. Rush, L. M. Ridgway and F. L. Taylor, all of New York City.

The Bacon Brake Shoe Co. has been incorporated in New York with a capital of $100,000. The directors are C. G. Bacon, Jr., E. W. Johnson and I. B. Johnson, all of New York City.

The Niagara Blower Company, of Buffalo, has been incorporated with a capital of $25,000 to make machinery. The directors are Maulsby Kimball, Henry Ginname and Hart Lincoln, all of Buffalo.

A contract has been awarded to the Guarantee Construction Co., of New York, by the Florida East Coast Railway Co., for building a through-span plate girder bridge 350 ft. long at St. Augustine, Fla.

The Neucraft Company, of New York, has been incorporated with a capital of $100,000 to make machinery. The directors are: H. I. Kimball, W. A. Woodbury and A. H. Gamble, all of New York City.

The Railroad Supply Company, Chicago, has removed its New York office from 114 Liberty street to room 810 Central Building, 143 Liberty street, where it is represented by Geo. S. Bailey and Hiram M. Buck.

The Davis Counterbalanced Locomotive Wheel Company, of New York, has been incorporated with a capital of $100,000. The directors are E. W. Cushing, R. B. Cushing and Clarence Boardman, all of New York.

The New Jersey Bridge Company, of New York, has been incorporated in New Jersey with a capital stock of $25,000 to build bridges. The incorporators are F. C. Gardner, L. A. Dietz and E. W. Stevens, all of Manasquan, N. J.

A contract, it is reported, has been awarded to Loftus Bros. Co., contractors, of Syracuse, N. Y., at $60,000, by the Canadian Government to cement the roofs of stations, roundhouses, freight houses, and bridges, of the Intercolonial R. R.

The National Lock Washer Company, of Newark, N. J., announces that it will in future supply the trade with the patent lock washers, nut locks and machines of the American Washer & Manufacturing Co., it having bought the business of the latter company.

The four steel cars forming part of the exhibit of the Pressed Steel Car Co. at the St. Louis Fair, and shown

in our issue of April 29, 1904, page 330, are equipped with Bartley bolt and nut fasteners made by the American Nut & Bolt Co., Frick Building, Pittsburg, Pa.

A. Leschen & Sons Rope Company has moved its New York offices to 163 Washington street, where a larger stock will be carried than formerly. This company has large works at St. Louis, Mo., where the main office is located, with branches in Chicago, Denver and San Francisco.

At a special meeting of the stockholders of the General Electric Company, held in Schenectady, May 10, it was decided to increase the capital stock $3,325,500, making the total $48,325,500. The annual meeting was also held, at which the present Board of Directors was re-elected.

Prof. Lewis M. Haupt and Mr. J. A. L. Waddell have been asked by the Congress of Arts and Sciences of the Universal Exposition at St. Louis, to deliver addresses in September next. Prof. Haupt's subject will be "The Present Problems of Civil Engineering." Mr. Waddell will speak on "The Relations of Civil Engineering to Other Branches of Science."

L. A. Shepard, 32 Broadway, New York City, has been appointed New York sales agent for the South Baltimore Steel Car & Foundry Co., Baltimore, Md. Besides handling the Car Company's business for all kinds of freight cars, castings and forgings, in the East, Mr. Shepard is the General Sales Agent for Benjamin Atha & Co., Newark, N. J., for cast steel bolsters and cast steel brake shoes.

The Carborundum Company, of Niagara Falls, N. Y., has shipped two carloads of its products to be displayed at the St. Louis exposition, where they will be placed in Block No. 16 in the Machinery Building. There is a pyramid of carborundum crystal 7 ft. high with a 6-ft. base, and wheels, sharpening stones and other products of the company; also samples of different work in which carborundum has been used. The display will be in charge of Wm. H. Arison and E. W. Gaylor.

Mr. Frank W. Edmonds, for many years Secretary and General Sales Agent for the Troy Steel Co. and later Secretary of the Q. & C. Co., representing the Pennsylvania Steel Co. and Maryland Steel Co. at Chicago, has been appointed Sales Agent of the Dressel Lamp Works, with offices at 114 Liberty street, New York city.

The Canadian business of the Allis-Chalmers Company, which recently bought the Bullock Electric Manufacturing Co., of Cincinnati, Ohio, will hereafter be conducted by a new company, the Allis-Chalmers-Bullock, Ltd., with works and principal office in Montreal. Mr. H. B. Croll, for several years in charge of the Salt Lake City offices of the Allis-Chalmers Co., and before that the representative of the E. P. Allis Co. at Spokane, has been appointed to take charge of the Allis-Chalmers office in San Francisco, with offices in 623 Hayward Building, succeeding Mr. George Ames, resigned.

Iron and Steel.

The Allegheny Steel & Iron Company will build tubular boiler works as an addition to its plant at Tarentum, Pa.

The United States Steel Corporation now has 84 furnaces in blast, with an output per week of 180,000 tons of Bessemer pig iron.

The Harrisburg Foundry & Machine Company on July 14 next will vote on the proposition to increase the capital stock from $400,000 to $500,000. The additional capital, it is reported, will be used to increase the size of its works.

The Dominion Iron & Steel Company, Sydney, C. B., started operations May 1 at its rod mill, which has a capacity of 200 tons per day. This is the first rod mill started in Canada. The works are now runinng at about half of their capacity.

Pneumatic Tool Litigation.

Notice was printed in our issue of Jan. 22 of the awarding of a decree for an accounting and a perpetual injunction against the manufacture of the pneumatic hammers of the Keller Pneumatic Tool Company sold by the Philadelphia Pneumatic Tool Company, infringing claims 42, 45, 46, 47 and 48 of Boyer patent No. 537,629, the points covered in these claims being given in that notice. On April 9th a final decree for accounting and perpetual injunction against the "further manufacture, sale or use of this particular type of pneumatic tool," was granted by the United States Circuit Court of the Eastern District of Pennsylvania, and the injunction was issued in accordance with said decree.

Exports and Imports for March.

The advance sheets of the monthly Summary of Commerce and Finance show that the value of exports for March was only $119,912,189, as compared with $132,093,964 in March, 1903. The value of total exports for nine months of the fiscal year ending April 1, however, increased materially, being $1,167,858,815, as against $1,114,162,027, the total value of all articles exported during a corresponding period in 1903. With regard to the effect of the war on exports, it is interesting to note that the large increase in the value of exports to Japan, which was apparent in the February report, is still more marked in the March report. During this month, exports to Japan reached a valuation of $2,469,504, as compared with $1,737,181 for the same month in 1903. The value of exports to Corea increased from $11,627, to $139,888. On the other hand, exports to Russia during the past month show only slight gains over March of last year. That the passage of the Reciprocity Bill is now beginning to have its effect on Cuba is apparent in the increase from $1,804,466 to $2,249,215 in the value of exports to that country for the month of March. There is, however, a considerable falling off in exports to Germany, France, Spain and England which more than offsets the gain in the smaller countries and accounts for the total decrease in exports for March. Exports for the past nine months of practically all classes of products show large gains, especially in the products of the forest and of mines. The exception is in the export of cotton goods, where there is a considerable falling off, owing to the high price of the raw material and the depressing effect of the war. During March alone there was a decrease of 428,548 in the number of bales of cotton exported.

Imports for the month of March not only show a heavy falling off, but during the nine months ending April 1, 1904, the value of imports decreased from $777,002,217 to $745,485,871. The largest loss in imports is with Great Britain, where a decrease in value of over $22,000,000 occurred. Imports from Cuba, on the other hand, increased in value during the past nine months over $6,000,000, most of this gain being due to the month of March, where an increase of $5,000,000 in the value of imports is recorded.

The General Railway Signal Company.

Officers of the Taylor and the Pneumatic Signal Companies announce that the negotiations for the consolidation of the two companies are proceeding favorably and that they expect to have them completed within a month. The headquarters of the consolidated company will be at Buffalo. John N. Beckley is slated for Chairman of the Board of Directors, W. W. Salmon for President, Frederick Cook, Vice-President, and George D. Morgan, Secretary and Treasurer. It is intended to issue $2,000,000 of 6 per cent. cumulative preferred stock and $3,000,000 common stock. The Taylor shops now employ 250 men and are running night and day. It is also said that the Buffalo shops are to be enlarged.

THE SCRAP HEAP.

Notes.

On the afternoon of May 6 at the Gilsey House, New York City, the officers of the Long Island Railroad gave a dinner to about 50 physicians from different towns on the line of the road. Vice-President W. F. Potter presided.

The Imperial Hotels Company is the name of an organization which has been chartered at Montreal for the purpose, as described in the press despatches, of putting up first-class hotels at principal points on the lines of the Grand Trunk Railway.

The Supreme Court of Appeals of the State of Virginia has confirmed the demurrage rules promulgated by the Corporation Commission of that State last August, and those rules have now been published, to go into effect May 15. The rules not only regulate demurrage, but also require railroad companies to furnish cars to shippers within a certain specified time, and to move all cars at 50 miles a day, under penalty of one dollar a day.

In the United States Circuit Court at Chicago on May 9 a temporary injunction was issued restraining ticket brokers in that city from dealing in reduced-rate non-transferable excursion tickets to and from the World's Fair at St. Louis. By agreement of counsel the question of enjoining the purchase and sale of other tickets was abandoned or deferred. The Chicago papers say that, as a result of this injunction, the railroads will now grant stop-overs in that city on St. Louis excursion tickets.

An excursion run by the Burlington from Chicago to St. Paul, May 8, at $10 for the round trip, stirred up a lively passenger rate contest between those cities, and the other roads at once announced tickets at that rate good on all trains. On the 9th it was said that some of the roads had offered round-trip tickets for $2. One of the lines made reductions on tickets to the Yellowstone Park and other points beyond St. Paul, the reason given for this being that the Burlington was making unduly low rates from Chicago to the Park.

The coroner's office, in Chicago, has recorded for the month of April 266 deaths by violence, of which 56 are classed as suicides. The coroner, who has examined a great number of cases, says that eight out of every 10 persons meeting death by violence are killed because of their own negligence rather than that of others. Thirty-nine persons were killed in April at grade crossings and on street railroads, and these cases in particular are due to contributory negligence. Contributory negligence is, however, too mild a term. In nearly every case the primary negligence rests on the victim himself.

Important reductions in the forces of men in nearly all departments have been ordered on the New York Central & Hudson River, and also on the Lake Shore & Michigan Southern and the Michigan Central. It is said that on the N. Y. C. over 1,000 men will be laid off; on the Boston & Albany 450 men, and on the Lake Shore 750. Similar reductions in expenses, due to a shrinkage in receipts, are reported from the Pennsylvania, the Lehigh Valley, the Erie, the Lackawanna, the Wabash, and the Big Four. In regard to these other roads few particulars are given, though one despatch says that the number of men dismissed from the shops of the Pennsylvania at Altoona is 600. A press despatch from Philadelphia says that at the Baldwin Locomotive Works the number of men now at work is 15,000, which is 10,000 less than the number during the busiest time of the past year.

A press despatch from New Haven, May 10, says, on the authority of President Mellen, that the striking shopmen of the New York, New Haven & Hartford have withdrawn their demand for an advance in wages, the company having shown that its rates were the highest paid by any railroad in that region. An earlier press despatch from Norwood stated that the company had granted some of the machinists an increase of 6⅔ per cent., and that it had been accepted. At Las Vegas, N. Mex., on May 10, the injunction secured by the Atchison against its striking shopmen, restraining them from interfering with the property of the company, was made permanent. The Atchison secured injunctions against the strikers at many other points along its lines. Officers of the road presented evidence that emery had been put in the bearings of engines and that other means had been taken to cripple the motive power.

At a hearing given by the Interstate Commerce Commission, in Chicago, May 6, officers of the Burlington, and of other roads, appear to have been quite free in giving testimony concerning unreasonably liberal allowances made by the railroads to large shippers in the shape of switching charges. According to the reports, Mr. Hamblin, of the Burlington, said that his company paid large sums to the Illinois Northern, a short road owned by the International Harvester Company. Before the Trust was organized, said Mr. Hamblin, the Burlington had its own tracks into the McCormick Harvester Works and switched cars free. Then came the organization of the Illinois Northern, capitalized for $500,000 and owned by the International Harvester Company, which bought the Burlington's tracks and began switching the cars of the Harvester Trust. "At first," said Mr. Hamblin, "we did not pay the Illinois Northern anything and we lost a great deal of the traffic of the McCormick people. When we began seeking the cause we were met with a demand for a division of the through rates and found the best terms we could obtain was 20 per cent. of the through rates to the Missouri River. We ascertained that they had an arrangement of this kind with the Santa Fe and the Grand Trunk and we were satisfied that if we got our proportion of the traffic we should have to pay the same." The Elgin, Joliet & Eastern was spoken of at the hearing as an industrial railroad.

Fast Run on the West Jersey & Seashore.

On April 29 train No. 631, from Camden to Atlantic City, consisting of six cars, was run from Egg Harbor to Absecon (10.6 miles) in 8 minutes. This is at the rate of 79.5 miles an hour. We are informed by an officer of the road, who gives us the figures, that this is not an unusual occurrence; but it is proper to say that there are very few items in our record of fast runs where this rate of speed is shown to have been kept up for so great a distance as 10 miles; and in those few the number of cars was less than six.

Appropriation for Rivers and Harbors.

In lieu of a general river and harbor bill, Congress agreed upon an Act containing in about 500 words temporary provision for the preservation of existing work and the restoration or maintenance of channels, and appropriating $3,000,000 to be immediately available and to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers. The money is to be used where the depth of the channels or the use of the improvement has become, or may become impaired and where no sufficient sum is available for maintenance. Allotments are to be made from the appropriation by the Secretary of War, but must be recommended by the local engineer in charge of the work and by the Chief of Engineers, and no single channel shall be allowed more than $50,000, nor any amount unless needed in the interests of navigation. To repair damage caused by the flood of 1903 and to continue and restore the improvements in the levee system of the Mississippi river, the Secretary of War may, as recommended by the Mississippi River Commission, make contracts for levee work on that river between Cairo and the Head of the Passes during the fiscal year ending June 30, 1905, to the extent of $1,000,000. No part of the appropriation shall be used for building government dredges for use on the Great Lakes or on the North Atlantic coast unless the construction has heretofore been authorized by the Secretary of War.

French Railroad in Madagascar.

The French are making progress on their railroad in Madagascar, which is to extend from Tamatave, a port on the eastern coast, to the capital, Tananarivo, which is in the interior 4,480 ft. above the sea. The climate on the coast is particularly deadly. The railroad (of metre gage) is built from the port 19 miles to a navigable lagoon, which will form a connecting link for some distance to Aniverano, whence the railroad will be 180 miles long to Tananarivo. Of this 18½ miles were opened in 1902, and now about 93 miles more are nearly ready for operation to the Mangoro river whence there is a good macadamized road to Tananarivo. The whole road will cost about $9,500,000, and will have 12 tunnels. The governor general reports that the greatest

achievement of the builders so far has been in overcoming the "natural laziness" of the natives, so that as many as 20,000 have been employed on the earthworks. Others have said that this laziness has been overcome by taxing the natives so many day's work, and corralling them till they did it. Another government enterprise has been a trades school at Tananarivo, where natives have been trained to be carpenters, masons and blacksmiths, and so have obviated to a considerable extent the necessity of employing whites in the deadly coast climate. (Usually a coast climate in the tropics is unfavorable to natives of the highlands of the same country.) The change already effected by the road and railroad is shown by the fact that the journey from Tamatave to Tananarivo is made now in three days, instead of nine as formerly; and the charge for transporting a ton of goods between the two places has been reduced from $240 to $60.

Demurrage and Diplomacy.

I asked a retail lumber dealer how they were treating him on demurrage and he answered that he paid a good many dollars to the railroad. I did not ask him why he had been obliged to do this, for I thought I knew why. No doubt he treats the railroad agent with the same indifference he treated me, and why shouldn't he pay demurrage? At a town 20 miles distant, on the same road, I talked with another dealer about demurrage and he said he had never paid a dollar in his life. "Don't you remember what you once wrote about keeping in with the station agent? Them's my sentiments. The agent and I get along first rate. One day I told him that I didn't know how in the dickens I could unload a certain car until three or four days later on, and he said that would be all right; do the best I could and that was all that could be asked of me. A fortnight ago I told him that I was in a hurry for some stuff that was coming in a car and when the car arrived it would be a favor if he would see that it was set in right away, and in it came on the tick of the watch. Then I bought a box of fifty cigars and took them in to him . . . ." It is in the power of the railroad agent to smooth over a thing or two with his principals if he is so inclined, and he is going to do it for the man that he likes. If he is dealing with an iceberg, with a man who looks at him askance because he is in the employ of a soulless corporation, he doesn't care a rap for him. I have talked with hundreds of dealers at the conventions, many of whom have told me they have never paid a dollar demurrage, and I have thought that I knew the reason why. Beloved, long before this we should have learned that vinegar is not the material with which to catch flies.—*American Lumberman.*

Passenger Traffic in Greater New York.

The figures of the surface and elevated car transportation in Greater New York, as compiled by the State Railroad Commission for the year ended February 29, 1904, show that during the year 1,036,834,773 passengers were carried on cash fares, as against 971,758,809 in the previous year, an increase of about 6.7 per cent. On transfers, the number carried was 252,853,130, making a total of approximately 1,290,000,000 passengers carried in a period of 12 months. During the same length of time, all the steam railroads in the country carried only 568,000,000 passengers, or less than one-half the number carried in Greater New York alone. If we calculate the present population of the five boroughs at about 4,000,000 people, it will be seen that the various lines in the city carried an aggregate of passengers equal to over three hundred times the entire population. In analyzing these figures, a gain of 37,318,852 is noted in the number of passengers carried during the year by the Interborough Rapid Transit Co. (formerly the Manhattan Elevated), while the figures of the New York City Railway Co., which operates the Metropolitan Co.'s lines, show a gain of only 144,311 passengers for the past twelve months, despite the fact that during the first three-quarters of the year, there was an increase of 5,129,287 passengers carried. The total number of passengers carried in Brooklyn on all lines was 320,107,163, an increase of 24,363,201 over the previous twelve months. The total car mileage in this borough was 60,733,233 miles, an increase of 3,069,386. In the borough of Queens and Richmond, there was an increase in the number of passengers carried of 1,260,964 and an increase in the total car mileage of 294,034. The total car mileage in the Greater City for the year was 197,826,719 miles, or an increase of 18,220,741.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

Franklin Institute.

At a meeting of the sections held in Philadelphia May 12, the programme included a paper on "Emery Wheels" by T. Dunkin Paret, of Stroudsburg, Pa.

PERSONAL.

—Mr. Andrew McNally, head of the printing and publishing firm of Rand, McNally & Company, of Chicago, died on May 7, at Pasadena, Cal., at the age of 66. Mr. McNally was born in Ireland and came to this country in 1858. Up to 1871 he was in the newspaper and job printing business, but after the Chicago fire he started his present establishment, one of the largest of its kind in the world.

—Mr. R. T. Shea, who resigned as General Superintendent of the Locomotive & Machine Company of Montreal when that company was acquired by the American Locomotive Company, has been placed in charge of the installation of the New York Central exhibit at the St. Louis Fair.

—Mr. A. E. Tabor, Master Mechanic of the St. Louis, Iron Mountain & Southern at De Soto, Mo., was instantly killed in the derailment of passenger train No. 18, at Kinswick, Mo., on April 30. Engineman Bailey and six other persons were also killed and many were injured. Mr. Tabor was riding in the locomotive. In consequence of an obstruction on the main track, this train had been ordered to run through a siding and to reduce speed for this purpose; but, for some unaccountable reason, Engineman Bailey did not shut off steam and the train entered the side track at full speed, overturning the engine.

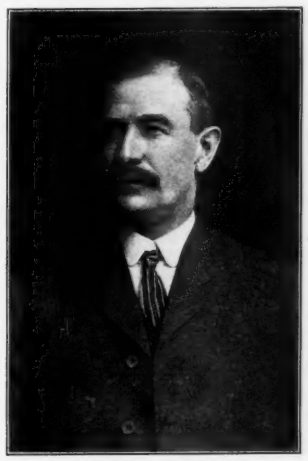
—Mr. William Ashton, who has been appointed Chief Engineer of the Oregon Short Line, is about 44 years old. Mr. Ashton is a native of Salem, N. Y., and was educated at Washington Academy. His first railroad service dates from 1881, when he began as a chainman on the Burlington & Missouri River, and with the exception of about two months when he was engaged on city work at Omaha, Neb., he was with the engineering department of that company until 1884. In March, 1885, he went to the Union Pacific, and for two years, from 1888, was Division Engineer at Denver. Mr. Ashton was appointed Resident Engineer of the Oregon Short Line in February, 1900, and has since held that position.

—Mr. Fred F. Hildreth, Mechanical Engineer of the Vandalia Line, has for the past four years been Master Mechanic for that company at Terre Haute, Ind. Mr. Hildreth was born in Bridge Hampton, N. Y., in 1865, and is a graduate of Rose Polytechnic Institute (Terre Haute), in the class of 1894. His first railroad work was in the shops of the Long Island Railroad, the Southern Pacific and the Union Pacific (1883-1890). After graduating in 1894, he returned to the Long Island as levelman on the Montauk Extension, but the next year went to the Vandalia Line as road foreman. From 1896 to 1899 he was Assistant Engineer of Motive Power, and then for a time was Acting Master Mechanic, receiving the full title of Master Mechanic in 1900, which position he has since held.

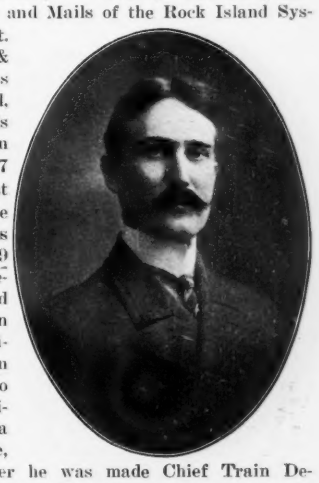
—Mr. William Wright, the new Superintendent of Motive Power of the Rock Island at East Moline, began his railroad work as an apprentice in the shops of the Grand Trunk at Stratford, Ont. In 1879 he went to Wilmington, Del., and entered the service of the Philadelphia, Wilmington & Baltimore, where he was successively machinist, draftsman, chief draftsman and assistant master mechanic. In 1893 he was transferred to Altoona, Pa., to take the position of Chief Draftsman in the Mechanical Engineer's office of the Pennsylvania Railroad, and that position he held until he was transferred, in 1898, to the position of Master Mechanic on the Vandalia Line, at Terre Haute, Ind. In December of the next year he went to Pittsburg, Pa., as Superintendent and Engineer of Construction, of the McKees Rocks Plant, of the Pressed Steel Car Company. Shortly after he went to England in the interests of the McConway & Torley Company of Pittsburg to demonstrate the automatic car coupler. Upon his return to the United States he was made Assistant Superintendent and Mechanical Engineer of the company, which position he now resigns to become Superintendent of Motive Power at East Moline for the Rock Island.

—Mr. J. A. L. Waddell, Consulting Engineer of Kansas City, Mo., has received from McGill University the degree of Doctor of Science. Mr. Waddell was born in Canada, and entered Rensselaer Polytechnic Institute in 1871, graduating with the class of '75. He spent three years in practice, chiefly on the construction of the Canadian Pacific Railway, taught two years at his alma mater, then spent two years in bridge work. Early in 188 McGill University conferred upon him the ad eundem gradum degree of Bachelor of Applied Science, and, later in the same year, the degree of Master of Engineering. In 1882 he took the Chair of Civil Engineering in the Imperial University of Japan, a position he occupied for four years. Before leaving Japan the Emperor knighted him and bestowed upon him the order of the Rising Sun with the rank of Knight Commander. In 1884 Wiley & Sons brought out his first book, "The Designing of Ordinary Iron Highway Bridges." He returned to this country in 1886 and located in Kansas City as the representative of the Phœnix Bridge Company and the Phœnix Iron Company. He soon resigned this position to devote himself entirely to his specialty, bridge engineering, in which he has become so well-known. In addition to designing a great number of bridges, many of them notable structures, and elevated railroads in Chicago, he has published another book, De Pautibus, has presented several important papers to the American Society of Civil Engineers, and has lectured at Rensselaer Polytechnic Institute, Rose Polytechnic Institute, McGill University, and the state universities of the Middle West. He is a member of the American Society of Civil Engineers, The Institution of Civil Engineers, Societe des Ingenieurs Civil, the Canadian Society of Civil Engineers, the Society for the Promotion of Engineering Education, the Rensselaer Society of Engineers, and honorary member of the National Engineering Society of Japan.

—Mr. C. H. Hogan, who since May 1, has been Division Superintendent of Motive Power for the New York Central & Hudson River, is 53 years old. He was born in Cleveland, Ohio, but his early education was received in New York State, as his family moved to Leroy, when he was six months old. At the age of 14 Mr. Hogan began his railroad work as a water boy for the New York Central. He worked for that company until 1867, as extra switch tender and as brakeman and fireman. He resigned from this company in 1867, and went to the Union Pacific, where he worked in the shop, finally becoming an Engineer. In 1871 he returned to the Central and ran a locomotive until 1893, at which time he was made traveling engineer. In January, the following year (1894) he was made road foreman. Five years later he went to East Buffalo as Master Mechanic, which position he has held until his recent promotion to the position of Division Superintendent of Motive Power at Depew, N. Y.



—Mr. John O. Crockett, who recently became Superintendent of Telegraph and Mails of the Rock Island System, including the St. Louis, Kansas City & Colorado Line, was born at Richmond, Ind., in 1868. His railroad work began when he was about 17 years old. His first service was on the Pennsylvania Lines as a messenger. In 1889 he was made train despatcher and served in that capacity on the Richmond Division until 1894, when he was transferred to the Main Line Division of the Vandalia Line at Terre Haute, Ind. Six years later he was made Chief Train Despatcher on this division, and in June, 1901, went to St. Louis as Chief Clerk to the General Manager. The next year he was promoted to be Superintendent of the Peoria Division, and a year later (1903) went to Logansport, Ind., as Superintendent of the Terre Haute & Logansport and the Logansport and Toledo Divisions of the Pennsylvania. He resigned from this latter position in January, this year, to go to Chicago, where he became Assistant to the General Manager of the Chicago, Rock Island & Pacific, which position he has held until his present appointment.



—Mr. Walter Morcom, the new General Manager of the Mexican Railway, has for 13 years been General Manager of the Mexican Southern. He was born in 1855, on the Isle of Man, England. His first railroad service was on the Grand Trunk of Canada in 1867. In 1871 he was made Secretary to the Superintendent, but soon after went to the Wabash, where he was in the offices of the Superintendent and the President. In 1878 he went to the Kansas City, St. Joseph & Council Bluffs, where he was in the freight department, and from there went successively to the Texas & Pacific, the Missouri Pacific, and the Mexican National, where, in 1883, he became General Freight and Passenger Agent. In 1889 he was made Traffic Manager of the Interoceanic of Mexico; in 1890 General Traffic Manager of the Mexican Southern, and soon after General Manager.

—Mr. George W. Kramer, Vice-President of the Colorado Midland and of the Utah Fuel Company, and Pres-

ident of the Globe Express Company, died recently, at the age of 53. Mr. Kramer was born in Sandusky, Ohio.

—Mr. Henry A. Van Alstyne, the new State Engineer and Surveyor of the State of New York, was born in Columbia County, N. Y., in 1869. Shortly after graduating from Union College (Civil Engineer) he took a position as Engineer in charge of construction of Public Works. In 1894 he entered the service of the State as Assistant Engineer on the Western Division of the State Engineer's department. Three years later he was appointed Superintendent and Engineer for the Furnaceville Iron Company of Rochester, N. Y., in connection with the improvement of the State canals on the Western Division, being in charge of about 35 miles of work and 1,000 men. In 1899 Mr. Van Alstyne returned to the State Engineer's department as Assistant Engineer of the Eastern Division, being subsequently promoted to First Assistant, Resident Engineer, and in 1901 to Division Engineer of the Eastern Division, which position he now leaves to become State Engineer and Surveyor, succeeding Mr. Edward A. Bond, who becomes Chairman of the Advisory Committee. Mr. Van Alstyne's office is of very great importance at the present time, since the work of building the barge canal across the State is under his direct supervision. He will serve until January 1 next under the appointment as the position is subject to the popular election, next November.

—Mr. Edward J. Pearson, whose title since May 1, has been Chief Engineer of the Northern Pacific, has for some time past been Acting Chief Engineer. He was born at Rockville, Ind., 41 years ago, and is a graduate of Cornell University. During 1881 Mr. Pearson was engaged on construction work in Kansas and Nebraska for the Missouri Pacific, and the next year did similar work in Indian Territory for the Atlantic & Pacific. In 1883 he went to Brainerd, Minn., and entered the engineering department of the Northern Pacific, but was later transferred to Portland, Ore., in connection with terminal work at that point. From 1890-1892 he was Division Engineer of the Eastern Division and in the latter year was made Principal Assistant Engineer at Chicago for the Chicago & Northern Pacific and the Wisconsin Central Lines. In 1894 he was Superintendent of the Missouri & Yellowstone Division of the Northern Pacific, and was transferred to the Rocky Mountain Division in 1895, and to the Pacific Division in 1897. Five years later he went to St. Paul as Assistant General Superintendent, but in April, last year, was transferred to the Middle District with a similar title. About four months later, following the resignation of Chief Engineer Darling, Mr. Pearson was put in charge of the engineering department with the title of Acting Chief Engineer.

—Mr. John F. Wallace, General Manager of the Illinois Central, has accepted the appointment of Chief Engineer in charge of the construction of the Panama Canal. It is said that Mr. Wallace will receive a salary of $25,000 a year. His work with the Canal Commission begins June 1. It is estimated roughly that about two years will be required to complete the surveys, make estimates of cost, and decide on the final plans, and that it will take 10 years to complete the canal. Mr. Wallace has been General Manager of the Illinois Central since the latter part of September, 1902. He was born in September, 1852, at Fall River, Mass., was educated as civil engineer at Monmouth, Ill., and in 1869 entered the service of the Carthage & Quincy Railroad as rodman. In 1870 he was Assistant Engineer on surveys for the Quincy, Alton & St. Louis; from 1871 to 1876, Assistant Engineer of the U. S. Engineer Corps, at Rock Island, Ill.; in 1879, Chief Engineer and Superintendent of the Peoria & Farmington; in 1887, Bridge Engineer on the Atchison, and subsequently built the joint entrance of the Atchison and Illinois Central lines into Chicago from the West. In 1891, Mr. Wallace was appointed Engineer of Construction, and the next year Chief Engineer of the Illinois Central, and during the five years he occupied this position the railroad was practically rebuilt. In 1901 he became Assistant General Manager, and in 1902, General Manager. Mr. Wallace is also past President of the American Society of Civil Engineers, the American Railway Engineering and Maintenance of Way Association, and the Western Society of Engineers; and he is a member of the Institute of Civil Engineers (England), the American Railway Association, the American Railway Guild, the Engineers' Club of New York, and other organizations. The Canal Commission is to be congratulated on its choice of an exceedingly able and progressive engineer, whose experience has been great and diverse, and who represents the best standards of American engineering in his energy, and in his ability to carry out, as well as to originate.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—J. R. Koontz has been appointed General Freight Agent, with office in Topeka, Kan.

Atlanta & Birmingham Air Line.—D. C. Porteous has been chosen Secretary, with office at New York.

Baltimore & Ohio.—The headquarters of G. A. Schmoll, Superintendent of Motive Power, have been removed from Newark, Ohio, to Wheeling, W. Va.

Bath & Hammondsport (Erie).—D. W. Cooke has been appointed General Passenger Agent and R. M. Parker General Freight Agent; both with offices at New York.

Canada Atlantic.—J. W. Smith has been appointed General Assistant, with office in Ottawa. Mr. Smith will have charge of the Purchasing and Car Service Departments. J. E. Duval, Car Service Agent, has resigned.

Chesapeake & Ohio.—B. F. Keefe, hitherto Trainmaster, has been appointed Superintendent of Terminals at Covington, Ky.

Chicago, Indiana & Eastern.—George W. Bartlett has been appointed Superintendent, with headquarters at Muncie, Ind.

Cornwall.—The following officers have been elected: President, A. M. Patch; Treasurer, J. P. Higginson, and Assistant Treasurer, F. F. Graham. Headquarters at Lebanon, Pa.

East Tennessee & Western North Carolina.—The general offices of this company have been removed from Cranberry, N. C., to Johnson City, Tenn.

Erie.—George A. Bergen has been appointed Assistant General Freight Agent of the Erie and the New York, Susquehanna & Western, in charge of Coal and Coke traffic east of Buffalo and Salamanca.

Galveston, Houston & Northern.—See Texas & New Orleans.

Houston, East & West Texas.—R. D. Parker has been appointed Resident Engineer, with headquarters at Houston, Texas.
See St. Louis, Brownsville & Mexico.

Interoceanic of Mexico.—See National of Mexico.

Mexican International.—See National of Mexico.

Michigan Central.—At a meeting held recently four new members were added to the Board of Directors, William H. Newman, William Rockefeller, James Stillman and Frederick S. Winston.

Missouri Pacific.—William F. Schmidt, heretofore Secretary to Vice-President Bird, has been appointed Foreign Freight Agent, with office at Chicago; and he will represent not only the Missouri Pacific, but the St. Louis, Iron Mountain & Southern, the Texas & Pacific, the International & Great Northern, the Wabash and the Denver & Rio Grande.

Missouri Southern.—The officers of this company are: President, F. D. Stout; Vice-President and Manager, C. W. Greer; Secretary and Treasurer, W. H. Allen, and General Freight Agent, H. N. Bennett. Headquarters at Leeper, Mo.

National of Mexico.—First Vice-President J. G. Metcalfe and Traffic Manager W. B. Ryan announce the organization of the general freight and passenger departments of this company, the Mexican International and the Interoceanic of Mexico, will be as follows: C. W. Fish, General Freight and Passenger Agent; George F. Jackson, Assistant General Freight and Passenger Agent; George J. Dwan, Assistant General Freight Agent; E. A. White, Assistant General Freight Agent; F. E. Young, Assistant General Passenger Agent. Headquarters in the City of Mexico, with the exception of Mr. Jackson, who will have his headquarters at Ciudad Porfirio Diaz.

New York, Susquehanna & Western.—See Erie.

Orange & Northwestern.—Philip Baber has been appointed Auditor, with office at Orange, Texas, succeeding E. P. Clawson, resigned.

Oregon R. R. & Navigation.—The authority of Chief Engineer W. H. Kennedy and Purchasing Agent F. G. Wheeler, of the O. R. R. & N., has been extended over the Southern Pacific lines in Oregon.

Oregon Short Line.—William Ashton, hitherto Resident Engineer, has been appointed Chief Engineer.

Pennsylvania Company.—R. C. Harris, hitherto Assistant Engineer of Maintenance of Way at Wellsville, Ohio, has been appointed Engineer of Maintenance of Way of the Marietta Division, with headquarters at Cambridge, Ohio, succeeding A. A. Wirth.

Pittsburg-Wabash Terminal.—James W. Patterson (President of the Pittsburg, Carnegie & Western,) has been elected President of the P. W. T., and W. J. Barnes, Jr., Secretary.

Pullman Company.—W. A. Hughes has been appointed Purchasing Agent, with office at Chicago, Ill., succeeding W. A. Angell.

St. Louis & San Francisco.—George A. Hancock has been appointed Superintendent of Motive Power. The position formerly held by Mr. Hancock, that of Superintendent of Machinery, has been abolished.
J. H. Elliott has been appointed Superintendent of Passenger Transportation, and C. H. Miller has been appointed Superintendent of Distribution of Power and Cars, with offices at St. Louis.

St. Louis, Brownsville & Mexico.—Jeff N. Miller, Vice-President and General Manager of the Houston, East & West Texas Lines, has been appointed Vice-President and General Manager of the St. L., B. & M. This company is now building between Brownsville, Texas, and Robstown, Texas. (See R. R. Construction, May 6, p. 354.)

South & Western.—John A. Muse has been appointed General Freight and Passenger Agent, with headquarters at Bristol, Va.

Southern.—The office of Assistant Superintendent at Columbia has been abolished, and O. D. Killebrew has been assigned to other duties.

Southern Pacific.—C. J. Jones has been appointed Assistant General Freight Agent.

Texas & New Orleans.—G. W. Vanderslice has been appointed Assistant Superintendent of this company and the Galveston, Houston & Northern, with office at Houston, Texas, succeeding A. S. Johnson, promoted.

Toledo, St. Louis & Western.—T. H. Hubbard has been elected Vice-President, with office at New York, succeeding Henry Budge.

Union Pacific.—T. J. Wyche has been appointed Resident Engineer in charge of the Nebraska and Wyoming Divisions, with headquarters at Omaha, and J. C. Beye has been appointed Resident Engineer in charge of the Kansas and Colorado Divisions at Kansas City.

LOCOMOTIVE BUILDING.

The Chicago, Peoria & St. Louis has ordered four locomotives from the Baldwin Locomotive Works.

The Copper Range has ordered one consolidation (2-8-0) locomotive and one mogul (2-6-0) locomotive from the American Locomotive Co.

The Kobe R. R., Japan, has ordered 15 more locomotives from the Baldwin Locomotive Works. This order makes a total of 55 locomotives that have been ordered from the Baldwin Works by the Japanese Government since the beginning of the war.

The Central Ontario, as reported in our issue of May 6, is having two simple passenger locomotives built at the Canadian Locomotive Co.'s works at Kingston, Ont., for May, 1904, delivery. These locomotives will weigh 115,000 lbs., with 90,000 lbs. on drivers; cylinders, 18 in. x 24 in.; diameter of drivers, 63 in.; extended wagon-top boiler, with a working steam pressure of 180 lbs.; 224 tubes 2 in. in diameter and 11 ft. long; tank capacity for water, 3,500 gallons, and coal capacity, eight tons. The special equipment includes: Westinghouse air-brakes, asbestos boiler lagging, Sterlingworth brake-beams, Buckeye couplers, Star headlights, Hancock injectors, U. S. *metallic* piston rod and valve-rod packings, Wilson sanding devices, Michigan sight-feed lubricators, Montreal Steel Works' springs, Morrison Brass Mfg. Co.'s steam gages and cast-iron wheel centers.

The El Paso & Northeastern, as reported in our issue of April 29, is having 18 simple Consolidation (2-8-0) locomotives built at the Baldwin Locomotive Works for June, 1904, delivery. These locomotives will weigh 210,000 lbs., with 165,000 lbs. on drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 57 in.; standard wagon-top boiler, with a working steam pressure of 200 lbs.; heating surface, about 3,050 ft.; 366 tubes 2 in. in diameter and 15 ft. 1 in. long; fire-box, 108 in. long and 66 in. wide; grate area, 49.5 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 10 tons. The special equipment includes; steel axles, Magnesia boiler lagging, Sterlingworth brake-beams, Handy couplers on pilot and Tower couplers on rear, Pyle-National Electric headlights, Nathan non-lifting injectors, Jerome piston rod and valve-rod packings, Crosby safety valves and steam gages, Leach sanding devices, Detroit sight-feed lubricators, Baldwin Co.'s springs, Standard driving, truck and tender-wheel tires and steel wheel centers.

The Illinois Central, as reported in our issue of April 29, has ordered 30 simple consolidation (2-8-0) locomotives from the American Locomotive Co. and five simple Atlantic type (4-4-2) locomotives from the Rogers Locomotive Works, for September delivery. The consolidation locomotives will weigh 200,500 lbs., with 180,000 lbs. on the drivers; cylinders, 22 in. x 30 in.; diameter of drivers, 63 in.; radial stayed boiler, with a working steam pressure of 200 lbs.; heating surface, 3,264 sq. ft.; 383 National Tube Co.'s tubes 2 in. in diameter and 15 ft. 6 in. long; Otis or Carbon steel wide fire-box, 108 in. long and 68 in. wide; grate area, 51 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 15 tons. The Atlantic locomotives will weigh 178,600 lbs., with 95,710 lbs. on the drivers; cylinders, 20 in. x 28 in.; diameter of drivers, 79 in.; radial stayed boiler, with a working steam pressure of 200 lbs.; heating surface, 3,129.2 sq. ft.; 331 National Tube Co.'s tubes 2 in. in diameter and 16 ft. 10¾ in. long; Otis steel wide fire-box, 102 in. long and 72 in. wide; grate area, 51 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 15 tons. The special equipment for both includes: Taylor iron axles, Gollmar bell ringers, Magnesia boiler lagging, Simplex brake-beams, Melrose couplers for consolidation locomotives, Ohio injectors, Cicero bronze journal bearings, Jerome and Sullivan piston and valve rod packings for consolidation, locomotives and Jerome piston and valve rod packings for Atlantic locomotives; Ashton safety valves and steam gages, Leach sanding devices, Nathan sight-feed lubricators, crucible steel springs for consolidation locomotives, and Railway Steel-Spring Co.'s springs for Atlantic locomotives, Gold steam heat equipment for Atlantic locomotives, Midvale and Latrobe truck and tender wheel tires, and cast steel wheel centers. Other specialties include: Chambers compensated throttle valves.

CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 15 cars.

The Southern is in the market for nine combination baggage and mail cars.

The Minneapolis & St. Louis is reported in the market for from 300 to 500 box cars.

The St. Louis Southwestern has ordered 76 box cars from the American Car & Foundry Co.

The Chicago & Eastern Illinois has ordered 10 cabooses from the American Car & Foundry Co.

The Union Pacific has ordered one sample steel hopper car from the American Car & Foundry Co.

The Illinois Central has ordered 250 drop-bottom gondolas from the American Car & Foundry Co.

The Copper Range has ordered 25 ore cars and 10 standard box cars from the American Car & Foundry Co.

The Mississippi Central has ordered 20 flat cars of 60,000 lbs. capacity from the Chattanooga Car & Foundry Co.

The Seaboard Air Line has ordered 1,000 steel cars. This order is equally divided between the Pressed Steel Car Co. and the Western Steel Car & Foundry Co.

The Buffalo, Rochester & Pittsburg has ordered 300 steel hopper cars of 100,000 lbs. capacity, 300 flat cars and 400 wooden gondolas from the American Car & Foundry Co.

The Canadian Northern is reported to be asking bids on 750 box cars of 60,000 lbs. capacity, 50 refrigerator cars, 10 first-class passenger coaches, 12 second-class coaches and six baggage cars.

The Chicago, Lake Shore & Eastern, as reported in our issue of May 6, has ordered 250 Williamson side-dump gondolas of 100,000 lbs. capacity from the Pressed Steel Car Co. for June and July, 1904, delivery. These cars will weigh 38,000 lbs. and will be 36 ft. long, 10 ft. wide and 8 ft. high, with steel underframes. The special equipment includes: Simplex bolsters and brake-beams, grey iron brake-shoes, Westinghouse brakes, Miner draft rigging, McCord dust guards, journal boxes and journal-box lids, Barber trucks and Griffin cast-iron wheels.

BRIDGE BUILDING.

BROADALBIN, N. Y.—The town board has decided to build a stone bridge to replace the present structure at Hooseville.

CHAMBERSBURG, PA.—The County Commissioners will replace the present structure over Carococheague Creek at West Market street with a concrete girder bridge.

CLEVELAND, OHIO.—The Lake Shore & Michigan Southern will, with its own men, build concrete bridges at Ashtabula, Willoughby and Angola during the present year. E. A. Handy is Chief Engineer.

COLONA STATION, ILL.—Bids are wanted May 30 by Captain C. S. Riche, 1637 Indiana avenue, Chicago, for building the superstructure of a single-track railroad bridge over Illinois and Mississippi canal.

DAYTON, OHIO.—The City Council has authorized the Board of Public Service to ask bids for building the bridge over the Miami River, at Herman avenue, in Riverdale, and to issue bonds for $10,000 to build a bridge over Wolf Creek, at Summit street.

DUNMORE, PA.—The Lackawanna & Wyoming Valley Electric Railway Co. will build a bridge over Roaring brook.

HARRISBURG, PA.—Viewers recommend the building of state bridges over Catawissa Creek, in Columbia County, over the north branch of the Susquehanna River connecting Luzerne and Columbia counties and over Conestoga Creek at Safe Harbor. The Attorney General objects to the proposed bridge over the Susquehanna River. It would cost about $175,000.

HAVERHILL, MASS.—A bill has been introduced in the State Legislature to authorize the Haverhill & Boxford Street Railroad Company to build a bridge over the Merrimac River.

GLEN COVE, N. Y.—The Board of Supervisors of Nassau County has awarded a contract for the new concrete bridge to be built here, to the Russell Contracting Co., of New York, at $19,616.

GLENNOVA, OHIO.—The West Virginia Bridge & Construction Co. has received a contract at $35,000 to build a railroad bridge, to be used by the Coal & Coke Railroad.

HONDO, TEXAS.—Bids are wanted May 20 by the Commissioners Court of Medina County for building six steel bridges.

JERSEY CITY, N. J.—The Board of Chosen Freeholders did not open the bids filed May 5 for the Arlington avenue bridge and have extended the time for the filing of the same (by the eleven bidders who were ready) until May 19.

LAFAYETTE, IND.—The Attica Bridge Co., it is reported, will build the bridge at Independence, over the Wabash River, for which Warren County has appropriated $89,990.

LYNDEN, WASH.—The City Clerk has been authorized to ask bids for building a bridge over Fishtrap Creek.

MALLORYTOWN, ONT.—Bids are being asked by the Township Clerk for building a steel bridge.

MILLHALL, PA.—Viewers recommend the building of an iron bridge 120 ft. long with 18-ft. roadway over Fishing creek.

MILWAUKEE, WIS.—Bids will soon be asked for a bascule bridge to be built at Michigan street at a cost of about $125,000.

Plans are being made for the double-deck bridge at Washington street, to have a 40-ft. roadway with 16-ft. widewalks, to cost about $430,000. Charles J. Poetsch is City Engineer.

MINNEAPOLIS, MINN.—All bids for the Thirty-second avenue bridge, which is to be a steel structure of five spans each 166 ft. long with 36-ft. roadway and 8-ft. sidewalks, have been rejected and new ones are asked May 27 by the City Clerk.

MOUNT MORRIS, N. Y.—The Delaware, Lackawanna & Western, it is reported, will build a new bridge over the Genesee River to replace the present structure.

NEW YORK, N. Y.—The Board of Estimate, on May 6, authorized the expenditure of $10,000,000 for work on the Manhattan bridge, over the East River, which is to begin about July 1.

PORTLAND, ORE.—Bids will soon be asked for building the bridge on Grand avenue, over Sullivan's Gulch, to cost about $25,000.

REDDING, CAL.—Residents are urging the building of a bridge over the Sacramento River; it will cost about $25,000.

ST. THOMAS, ONT.—Bids are being asked by Bell & McCubbin, civil engineers, for a steel bridge in Yarmouth.

SCHUYLER, NEB.—Bids are wanted May 21 by J. P. Maple, Colfax County Clerk at Schuyler, Neb., for building all the bridges that may be needed in Colfax County for one year.

SEDAN, KAN.—Bids are wanted May 24 by Chautauqua County Commissioners for building one highway bridge 100 ft. long and one 80 ft. steel bridge over Big Caney River; also for the stone abutments and retaining walls.

SKOWHEGAN, ME.—Bids are wanted May 20 by Butler & Butler for building the superstructure of the steel highway bridge 226 ft. long over the south channel of the Kennebec River. Charles A. Marston is a member of the committee.

SPOKANE, WASH.—The County Commissioners have authorized the asking of bids for a bridge over the Little Spokane River to replace the Dawson bridge.

STAUNTON, VA.—Bids are wanted May 30 by the Clerk of Augusta County for building an iron bridge 150 ft. long over Christian's Creek; also for two abutments with wing walls. Address Wm. F. Koiner, Waynesboro, Va.

TOLEDO, OHIO.—The bids opened May 3 for the bridges at Grand Rapids and at Waterville were as follows: The Brackett Bridge Co., Cincinnati, $48,950, $23,000; Bellefontaine Bridge & Iron Co., $48,100, $21,000; Pan-American Bridge Co., Newcastle, Ind., $47,500, $24,500; West Virginia Bridge & Construction Co., Wheeling, $49,600, $22,000; Virginia Bridge & Iron Co., Roanoke, $51,000, $22,129; Variety Iron Works Co., Cleveland, $47,600, $22,575; King Bridge Co., Cleveland, $49,000, $21,900; Massillon Bridge Co., two bids for Grand Rapids bridge, $48,900 and $48,700; twelve bids for Waterville bridge, from $18,300 to $21,200; Houston & Cleveland Bridge Co., Columbus, Grand Rapids bridge, $47,850 and $46,950; Waterville bridge, three bids, from $21,100 to $21,300; Canton Bridge Co., twelve bids for Grand Rapids bridge, from $29,990 to $46,990; Waterville bridge, $21,200 and $21,400; Cowing Patent Lift Bridge Co., Cleveland, five bids for Grand Rapids bridge, from $50,100 to $52,600; Waterville bridge, five bids, from $22,000 to $25,000.

TORONTO, ONT.—Plans for the Yonge street bridge are awaiting the government's approval. They call for a bridge 940 ft. long and 60 ft. wide with 38-ft. roadway supported on masonry abutments 160 ft. south from Front street and 140 ft. north from Lake street. Between the abutments there will be eight steel supports.

TOWANDA, PA.—Viewers recommend the building of a county bridge over Rummerfield Creek at Coe's.

Viewers report favorably upon the question of building a county bridge about 1,500 ft. long over the Susquehanna River at North Towanda.

UMATILLA, ORE.—Surveys are being made for a bridge to be built over the Umatilla River, near this place.

WILMINGTON, DEL.—Residents are agitating the question of building a bridge over Brandywine Creek at Church street to connect with Locust street.

YORK, PA.—Viewers have been appointed to report upon the question of building a steel bridge 240 ft. long with 18-ft. driveway over Big Conewago Creek at Yorkhaven, to cost $20,000, to replace the structure destroyed by floods.

Other Structures.

ANNAPOLIS, MD.—A contract for building the new academic building at the Naval Academy has been awarded to the John Pierce Construction Co., of New York, at $1,379,900. This building will be next to the largest of the new group and will be built of Maryland granite.

ASHEVILLE, N. C.—The Southern Railway, it is reported, will build a passenger station here.

ATTALLA, ALA.—The Louisville & Nashville, it is reported, has bought 7½ acres of ground as a site for a new passenger station.

CARDENAS, MEX.—The Mexican Central, it is reported, will establish repair shops here. B. Johnson, Mexico City, Superintendent of Motive Power and Machinery, can give information.

CINCINNATI, OHIO.—The Bullock Electric Manufacturing Co., it is reported, will build a 300-ft. addition to its machine shop and put in some heavy machine tools.

DALLAS, TEXAS.—A plant for working sheet metal will be built during the summer by the Atlas Metal Works, recently organized with a capital of $25,000.

DENVER, COLO.—The Denver, Northwestern & Pacific, it is reported, will build large car shops.

GRAND RAPIDS, MICH.—The Pere Marquette, it is reported, has given a contract to the George B. Swift Co., Chicago, at about $300,000 for building large machine shops at Grand Rapids and at St. Thomas, Ont.

MATAWAN, N. J.—The Matawan Steel & Iron Co., it is reported, will put up a foundry 61 x 160 ft., a power house 26 ft. x 39 ft., and a building 24 x 40 ft.

MEMPHIS, TENN.—It is reported that the Illinois Central will immediately spend about $250,000 on its machine shops here to double their capacity.

NEWBERRY, PA.—The Philadelphia & Reading, it is reported, will build car shops here.

PEKIN, ILL.—The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, will build a large roundhouse.

PITCAIRN, PA.—The Pennsylvania, it is reported, will build a machine shop to cost about $30,000.

RED OAK, IOWA.—The Red Oak Bridge & Iron Co. is having plans made for building its works, to consist of several buildings.

REYNOLDSVILLE, PA.—The American Production Company, recently organized with a capital of $300,000, will take over the works of Charles McSherry at Pittsburg, Pa. New buildings will be put up on the ground bought in Reynoldsville, including an office building 24 x 46 ft., a foundry 75 x 100 ft. and a machine shop 65 x 300 ft. in which brass, steel and iron castings and tools for sheet metal workers will be made.

ST. JAMES, L. I.—Residents have offered to give land as a site for a new passenger station.

TALLAHASSEE, FLA.—The Moultrie Iron Works Company, of Moultrie, Ga., will soon ask bids for building a foundry, machine shop and other buildings at Tallahassee.

VANCOUVER, B. C.—The Great Northern, it is reported, has bought land consisting of nine lots as a site for its terminal buildings at Columbus and Dupont streets, for about $125,000.

WINNIPEG, MAN.—The Winnipeg Electric Street Railway Co., it is reported, is asking bids for a car barn 100 ft. x 180 ft.; also for new shops, to cost about $30,000, at Fort Rouge.

A blacksmith and machine shop 64 ft. x 165 ft. will be built by the Vulcan Iron Works.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

CALIFORNIA ROADS.—It is reported that the Pacific Steel Co., which was recently organized in California, is about to build a line of railroad from San Diego, Cal., to La Paz, traversing the whole southern part of the peninsula of Lower California. The headquarters of the company are at San Diego.

CANADIAN NORTHERN.—It has been officially announced that this company has let a contract to J. D. McArthur, of Winnipeg, for building its line to Edmonton. This contract includes grading, bridging and track laying.

CANADIAN PACIFIC.—This company is about to begin work on its new line from Toronto, Ont., to Sudbury, paralleling the Grand Trunk between Toronto and North Bay. The contract for this work has been let to Foley Bros., Larson & Co.

CANEY & WEST LIBERTY.—Articles of incorporation have been filed by this company in Kentucky. It is proposed to build a railroad from Cannel City, in Morgan County, Ky., through Caney to West Liberty, eight miles. W. N. Reed, C. M. Martin, W. B. Smith and others, of Paducah, Ky., are incorporators.

CHICAGO, ANAMOSA & NORTHWESTERN.—An officer writes that the contract for grading this road has been let to John Foley, Anamosa, Iowa. The proposed route is from Anamosa through Prairiesburg and Coggan to Waterloo. The work is easy and includes several steel bridges. Henry Kiene, Dubuque, Iowa, is President, and J. F. Lacord, Anamosa, is Chief Engineer. (April 29, p. 336.)

CHICAGO & NORTHERN INDIANA (ELECTRIC).—Articles of incorporation have been filed by this company in Indiana. It is proposed to build an electric railroad from Indianapolis to Chicago, passing through the counties of Lake, Porter, Jasper, Pulaski, White, Cass, Howard, Clinton, Hamilton and Marion. Lester Soule, Des Moines, Iowa, is said to be interested.

CHERRY TREE & DIXONVILLE.—A contract has been let to Chas. A. Sims & Co., Philadelphia, for grading a seven mile extension of this road from Hines on the north branch of Twolick Creek to Possum Glory. Work will be begun at once. The road runs at present from Cherry Tree, Pa., to Hines, 14 miles, and is owned jointly by the New York Central and the Pennsylvania. (*April 8, p. 281.*)

CHICAGO & ALTON.—This company will soon have its new 65-mile cut-off finished between Mexico, Mo., and Old Monroe, making the distance between St. Louis and Kansas City 279 miles. The cut-off is level and straight, the maximum grade being only 26 ft. to the mile. The maximum curvature is only 1 per cent.; 92 per cent. is perfectly straight track. There is one tangent of 18 miles and another of 14 miles. The bridges are of steel, the culverts are of concrete, and the road is ballasted with rock. The rails are 85 lb., 33 ft. long. There are 13 passing tracks of 3,000 ft. each. There are no grade crossings for railroads and very few grade crossings for country roads. Four daily trains in each direction will be run.

CHICAGO & NORTHWESTERN.—An officer writes that this company has no intention of building a cut-off from Crescent, Iowa, northeast to Harlan.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—It is stated that the betterment work which is being done by this company in Illinois and Indiana will be finished by the first of August. A new second-track line is being built from East St. Louis to Hillsboro, 45 miles, and from Hillsboro to Pana, Ill., 25 miles. The present line of the C., C., C. & St. L. is being double tracked and the grade changed. When the work is completed, the trains of the St. Louis & San Francisco from St. Louis to Chicago will run over the new line to Pana. Work is also in progress between Lawrenceburg Junction and Sunman, Ind., and it is stated that the earthwork and masonry on this line will be finished by August 1. All curves are being reduced to 1½ degrees.

COAST R. R.—A charter has been granted this company in Mississippi to build an electric railroad from Biloxi east to Pascagoula, 20 miles. The electric line will parallel the Louisville & Nashville between these points. The names of incorporators are not stated.

DALLAS & ROSWELL.—Press reports states that work will soon be begun on this proposed railroad from Dallas, Texas, to Roswell, N. Mex., 500 miles. E. P. Spears, Dallas, Texas, is President.

DELAWARE & HUDSON.—This company is about to begin work on a second track from Jefferson Junction to Nineveh, 22 miles.

DENVER & BOULDER INTERURBAN.—Incorporation has been granted this company in Colorado to build an electric railroad from Denver northwest to Boulder, 25 miles. S. B. Toney, J. R. McKinnie and others, of Denver, Colo., are incorporators.

DENVER, WOODWARD & SOUTHEASTERN.—This company has been chartered in Colorado with an authorized capital stock of $20,000,000 to build a railroad from Denver, Colo., in a southeasterly direction through Oklahoma and Indian Territories to Texarkana, Ark., a total distance of approximately 1,000 miles.

GREAT BEND & SOUTHERN.—A charter has been granted to this company in Kansas to build a railroad from Great Bend southeast through the counties of Barton, Stafford, Pratt and Harbor to Medicine Lodge, 75 miles. A. A. Patterson, Benton Harbor, Mich., J. G. Brinkman and R. O. Russell, Great Bend, Kan., and others are incorporators.

GULF, HUTCHINSON & NORTHWESTERN.—An officer writes that the proposed route of this road in Kansas runs through the following towns: Arkansas City, Wellington, Cheney, Hutchinson, Hudson, Great Bend, Russell, Lenora, Oberlin and St. Francis. No surveys have as yet been made, but it is estimated that the work will be easy. There will be a few small bridges, but no tunnels. Eugene Tilleux, Hutchinson, is President, and G. W. Winans is Secretary and Treasurer. (April 29, p. 336.)

KANSAS CITY, MEXICO & ORIENT.—Press reports state that the Orient line from Milton to Wichita, Kan., 29 miles, will be finished in 60 days. This will give the K. C., M. & O. a complete line between Wichita, Kan., and Fairview, Okla. T., a distance of 150 miles. Surveys are now in progress for an extension from Wichita to Emporia. (See Construction Supplement.)

LAKE SHORE & MICHIGAN SOUTHERN.—Press reports state that this company will spend about $1,500,000 during the summer in building third and fourth tracks on its Eastern, Western and Toledo divisions and will increase facilities at many freight yards.

LOUISVILLE & NASHVILLE.—The Cane Creek branch of this road from a point seven miles north of Birmingham, Ala., west to the Warrior River, 17.58 miles, is now practically completed, and it is stated that it will be open for traffic about June 1. Work is progressing rapidly on the extension of the Oneonta & Attalla branch from Altoona to Attalla, Ala., 15½ miles. It is reported that this line will also be open for traffic very shortly. (April 8, p. 282.)

MEXICAN CENTRAL.—Press reports state that this company is about to extend its Guanajuato branch line from the present terminus at Marfil to the mining camp at Valenciana.

MEXICAN ROADS.—A concession has been granted by the Mexican Government to the Monterey Coal Co. for building two lines in the State of Coahuila. One is to connect with the Mexican International at a point between kilometers 118 and 119 and the other is to connect with the City of Muzquiz. L. J. Schofield, of Las Esperanzas, in the State of Coahuila, may be addressed.

It is reported that work is well advanced on the proposed railroad which is being built by the Pittsburg-San Jose Reduction & Railroad Co. from San Jose to Parral, 45 miles. About 20 miles have been completed and grading is in progress on the remaining 26 miles. It is stated that the line will be finished and open for traffic by July 1. It is the intention of the company to ultimately build a railroad from Durango, Mex., to a point in the vicinity of El Paso, Tex. Preliminary surveys for this line are now in progress.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Work is reported in progress on relaying the track on this road between Minot, N. Dak., and Portal, 75 miles. This part of the line was so badly washed during the spring floods that no trains have been run over it since April 16.

MISSOURI, KANSAS & TEXAS.—Press reports state that a contract has been let for building an extension from Oklahoma City to Wichita Falls, Texas, 184 miles. It is stated that work will be begun within 90 days.

NEW YORK SHORT LINE (PHILADELPHIA & READING).—This company has awarded a contract to the Millard & McGraw Construction Co. for building the first section of its cut-off from Cheltenham to Neshaminy. The work on this section will be light, and will include one 60-ft. arch bridge over Poquessing Creek and several smaller bridges. The new line will be double-tracked between Neshaminy Falls and Cheltenham. It is the intention of the company to run its fast express trains over this new cut-off, and thus relieve the road between Tabor and Jenkintown of some of the heavy traffic. (April 15, p. 298.)

OPELOUSAS, GULF & NORTHEASTERN.—This company has been organized in Louisiana to build a railroad from Opelousas in a northeasterly direction to a connection with the Texas & Pacific and in a southwesterly direction to a point on the Gulf of Mexico near Rayne. T. H. Lewis is President, E. P. Veazie, Vice-President, and J. J. Thompson, Treasurer, all of Opelousas, La.

ROCKDALE, JOLIET & LOCKPORT.—Articles of incorporation have been filed by this company in Illinois. It is proposed to build a railroad from Rockdale in a northerly direction to Lockport, with several branches. C. W. Brown, Frederick Jackson and others, of Joliet, Ill., are incorporators.

ST. MARYS & WESTERN.—A charter has been granted this company in Pennsylvania to build a railroad from Johnsonburg to Benezette, 25 miles. J. K. P. Hall is President.

SAN FRANCISCO & NAPA.—A charter has been granted this company in California to build a railroad from San Francisco to Napa, 50 miles. S. M. Van Wyck, Jr., San Francisco, and H. B. Goodman, Napa, Cal., are interested. (See Construction Supplement.)

SAN FRANCISCO & NORTHWESTERN (A. T. & S. F.).—Work is reported in progress on this road from Alton, Humboldt County, Cal., south to a connection with the Atchison, Topeka & Santa Fe, near Point Richmond, 200 miles. The work will include a tunnel 1,000 ft. long in Humboldt County, near the southern end of the Eureka & Eel River road. W. B. Story, Chief Engineer of the Santa Fe, is said to be in charge of the work. (See Construction Supplement.)

SPRINGFIELD, PETERSBURG & BEARDSTOWN (ELECTRIC).—Articles of incorporation have been filed by this company in Illinois. It is proposed to build an electric railroad from Springfield northwest through Petersburg to Beardstown, 45 miles. J. S. Hurle, J. S. Miles and others, of Petersburg, Ill., are interested.

WESTERN MARYLAND.—While the work of building the various connecting links of the Wabash is being hurried at a rapid rate, it has been announced that reconstruction work will soon be begun on the main line of the Western Maryland, between Baltimore and Hagerstown. It is stated that the line will be reballasted and laid with 90-lb. rails along its entire length. The Tidewater extension, which is being built from Wallbrook station at Baltimore to tidewater, seven miles, is now practically completed and will be open for traffic about June 1. On the extension from Cherry Run, W. Va., to Cumberland, Md., to connect the Western Maryland with the West Virginia Central & Pittsburg, three miles of track have been laid and grading is almost half finished. As soon as these two links and the reconstruction work on the Western Maryland are finished, the Wabash will have a through line from Pittsburg to tidewater.

GENERAL RAILROAD NEWS.

BLACKSTONE & SOUTHERN.—On petition of a creditor, A. B. Dickinson, Richmond, Va., and Benham Morris, of Blackstone, Va., have been appointed receivers. The road was never completed, but rights of way and franchises were secured for a line between Blackstone, Va., and Westboro.

BOSTON & NORTHERN STREET.—The stockholders of the Boston & Northern Street, at a special meeting, held on May 10, authorized a general mortgage bond issue amounting to $15,000,000 covering all the properties of the company. The bonds will bear 4 per cent. interest and will extend for a period of 50 years. The proceeds from the sale will be used to refund outstanding obligations.

CANADIAN EASTERN.—It is stated that negotiations are now under way for the purchase of this property by the Dominion Government. The road is 125 miles long and runs from Fredericton via Chatham to Loggieville, passing along the St. John River and connecting with the Canadian Pacific at Fredericton. Its freight traffic is principally lumber and coal.

CENTRAL INDIANA.—Dominick & Dominick, New York, are offering at 97½ and interest $750,000 Central Indiana first-mortgage 4 per cent. 50-year gold bonds, guaranteed by the Cleveland, Cincinnati, Chicago & St. Louis.

CHICAGO, BURLINGTON & QUINCY.—It is stated that a suit is about to be brought by the State of Nebraska to annul the merger of the Kansas City & Omaha with the Burlington, which occurred two years ago. The Kansas City & Omaha, 250 miles in length, parallels Burlington lines along its entire length. Three years ago the C., B. & Q. acquired a controlling interest in the K. C. & O. and one year later it was merged with the Burlington. Certain patrons of the Kansas City & Omaha complain that the Burlington has operated the line without regard to the convenience of the towns through which it passes, and have petitioned the State to bring suit under the anti-merger law to annul the agreement between the two roads.

CHICAGO, ROCK ISLAND & PACIFIC.—See Choctaw, Oklahoma & Gulf below.

CHOCTAW, OKLAHOMA & GULF.—An official notice has been sent out stating that after May 1 this road will be operated as the Choctaw Division of the Rock Island System. The line runs from Memphis, Tenn., to Amarillo, Texas, 760 miles, and is now being extended to Tucumcari, where it will form a connection with the Rock Island main line to the southwest.

COLORADO & NORTHWESTERN.—This road has been sold under foreclosure proceedings to S. B. Dick, of Pennsylvania. The price paid was $100,000. The road has been built from Boulder, Colo., to Ward, a distance of 19 miles. It is announced that the main line will now be extended to Eldora where connection will be made with the Denver, Northwestern & Pacific.

DELAWARE & HUDSON.—It has been officially stated that from the recent sale of the 70,000 shares of new stock, the following indebtedness has been paid: $5,000,000 for refunding the New York & Canada Railway Co.'s bonds which matured on May 1, 1904; $2,462,000 for the standard gaging of the Chateugay R. R.; $540,000 for new rolling stock; $585,000 for retirement of debentures, and $364,500 for sinking fund purposes. (April 8, p. 282.)

At the annual meeting of the stockholders on May 10, the lease of the Chateaugay & Lake Placid R. R. was approved. At the same meeting the Board of Managers was authorized to remove the headquarters of the D. & H. from New York to some point on the line.

ERIE.—As a result of the dissolution of the voting trust of this company, application has been made to the New York Stock Exchange to list $7,892,400 first preferred stock, $16,000,000 second preferred stock, and $112,378,000 common stock. The first and second preferred stock are entitled to 4 per cent. non-cumulative dividends, but no dividend has ever been paid on either the second preferred or the common stock. With regard to the financial situation of the company, an executive officer is reported to have made the following statement:

"Having already applied $3,500,000 of the first issue of $10,000,000 of our convertible bonds, we have a balance of $6,500,000 to meet general improvement work. In addition, we have available $3,500,000 from our Pennsylvania and first consolidated mortgage bonds.

"The new work on our Jersey City terminal will cost between $4,500,000 and $6,000,000, depending on details in the plans which have not yet been decided. These improvements, together with other minor ones in the neighborhood of New York, may possibly require the expenditure of the whole of our present available balance. It is problematical at this time whether the board can continue to pay the dividend on the first preferred stock at the present rate. Figures for the first four months of this year indicate a falling off in earnings of roughly $1,500,000 as against July, August, September and October of last year. The business of May and June alone can decide whether the last dividend declaration can be repeated."

GAINESVILLE, JEFFERSON & SOUTHERN.—An order has been issued by Judge J. J. Kimsey, of the Northeastern Circuit Court, calling for the sale of this railroad at Gainesville on June 21. The road, which runs from Gainesville to Social Circle, 50 miles, with a branch line to Jefferson, has been operated by a receiver for several years. It is stated that the Georgia R. R., with which it connects at Social Circle, will be the purchaser.

GEORGIA, FLORIDA & ALABAMA.—It has been officially announced that this road has purchased the Carrabelle, Tallahassee & Georgia running from Carrabelle, Fla., to Tallahassee, 50 miles. The company has also bought the steamboat line between Carrabelle and Pensacola which was formerly operated by the C. T. & G. The two roads will be operated in future as one. J. P. Williams, Savannah, Ga., is President.

KANSAS CITY & OMAHA.—See Chicago, Burlington & Quincy above.

MICHIGAN CENTRAL.—Application has been made to the New York Stock Exchange to list $1,000,000 additional 3½ per cent. first-mortgage gold bonds. These bonds are a part of $6,000,000 reserved to be used for additions and improvements. The total amount of 3½ per cent. bonds now outstanding is $12,000,000.

The annual report for the fiscal year ending Dec. 31, 1903, which will be reviewed next week in another column, shows an increase in gross earnings of $3,507,118. Operating expenses increased $3,395,000, leaving a small increase in net earnings of $112,000. The number of tons moved during the year was 14,116,818, or an increase of 2,470,707 tons more than in 1902. The number of passengers carried increased from 3,741,312 to 3,859,748. Charges for maintenance of way and structures decreased, while the charge for maintenance of equipment increased $1,164,340. Conducting transportation also showed a large increase owing to the higher cost of fuel and wages. After the payment of all outstanding fixed charges, the income available for dividends amounted to 6.64 per cent., as compared with 5.92 per cent. during the previous year.

NEW YORK, NEW HAVEN & HARTFORD.—It has been announced that this company will abandon the famous Tariffville "loop." The loop, which is about 3½ miles long, was built around the Montague farm in Granby, Conn., by the Central New England a few years ago in order to give that road a connection between Hartford and Springfield. Permission to run the road across the farm had been refused after a legal fight with the New York, New Haven & Hartford interests which controlled the Montague property. As the N. Y., N. H. & H. now controls the Central New England, the "loop" is of no further value.

NEW YORK, ONTARIO & WESTERN.—A special meeting of the directors of this company has been held, and the petition of the stockholders to dissolve the voting trust has been referred to a committee consisting of G. B. Schley, G. L. Hoyt and C. S. Blair.

Kuhn, Loeb & Co. have bought $1,000,000 of New York, Ontario & Western 4 per cent. bonds. This is a part of a total authorized issue of $20,000,000 first-mortgage bonds of which about $17,000,000 have already been issued. The bonds now sold will fund certain extraordinary expenditures and the cost of double-tracking.

NORTHERN CENTRAL.—At a meeting of the directors on May 10, a resolution was adopted authorizing a stock issue of $5,731,150 to be offered to stockholders at $62.50 a share, the par value being $50. The proceeds from the sale will be used to pay the funded debt, maturing July 1, amounting to $2,000,000, to purchase the outstanding bonds of the Shamokin Valley & Pottsville R. R., amounting to $1,562,000, and to pay off the temporary loans which were made for building the second-track line between Yorkhaven and Bridgeport and the Fairview yard, and which amounts to $3,538,000. This action was taken as a result of the annual meeting last November, when the capital stock was increased from $12,000,000 to $20,000,000, and the directors were authorized to issue new stock to retire outstanding bonds and to pay for new improvements.

PERE MARQUETTE.—The report for the year ending December 31, 1903, shows that net earnings were $1,616,678, an increase of $630,764 over 1902. With regard to the arrangements for running trains through to Chicago and to Buffalo, the following statement is made in the report:

The company began the operation of its extension into Chicago about January 1, 1904, and the line has from the start fully met expectations. An agreement with the Canadian Southern and Michigan Central companies has been executed, giving the Pere Marquette joint use of their tracks between St. Thomas and Buffalo and also Niagara. This agreement has been ratified by the Canadian government. A contract for 21 years has also been entered into with the New York Central providing for the use of its terminals at Buffalo. During the past year the local business of the Pere Marquette, originating principally in Michigan and destined to points beyond Buffalo, amounted to 60,108 loaded cars. By the changing of the property from a local railroad in Michigan to a through trunk line it will permit the company to improve its service through Michigan. This has suffered severely in the past from the fact that the company has been unable to give shippers the proper service, being dependent upon foreign roads for its connections into Chicago and Buffalo.

PITTSBURG, LISBON & WESTERN.—See Wheeling & Lake Erie below.

RICE BELT R. R.—A conference has recently been held between the people interested in this company and the St. Louis, Brownsville & Mexico, and an agreement has now been reached to adjust the relations between these two roads. The St. Louis, Brownsville & Mexico was recently incorporated to build a railroad from Robstown, Texas, to Brownsville and eventually to Houston. About the same time the Rice Belt R. R. was incorporated to build between Houston and Brownsville. As the interests which control these roads are largely the same, it has been decided not to use the charter of the Rice Belt R. R., but to extend the St. Louis, Brownsville & Mexico between the latter points instead.

ST. LOUIS, BROWNSVILLE & MEXICO.—See Rice Belt R. R. above.

SOUTHERN INDIANA.—King, Hodenpyl & Co., New York, and G. A. Fernald & Co., Boston, are offering at 92½ and interest $1,000,000 of this company's outstanding issue of $4,510,000 first mortgage 50-year gold bonds. The company owns 178 miles of main track from Terre Haute to Westport through the best coal fields of Indiana. The company also owns terminals at Terre Haute and enters that city through a lease of half a mile of track from the Terre Haute & Indiana. A belt line, 10 miles in length, is now being built by the Southern Indiana around the city of Terre Haute so as to avoid taking coal through the city, and to secure connection with diverging lines outside the city limits. Stone ballast and 70-lb. rails are being used. The equipment has cost $3,707,284, of which amount over $2,000,000 has already been paid.

WHEELING & LAKE ERIE.—At the annual meeting of the stockholders of this company, the purchase of the Pittsburg, Lisbon & Western R. R., running from New Galilee, Pa., to Lisbon, Ohio, 25 miles, with branch lines aggregating nine miles, was ratified. (May 6, p. 354.)